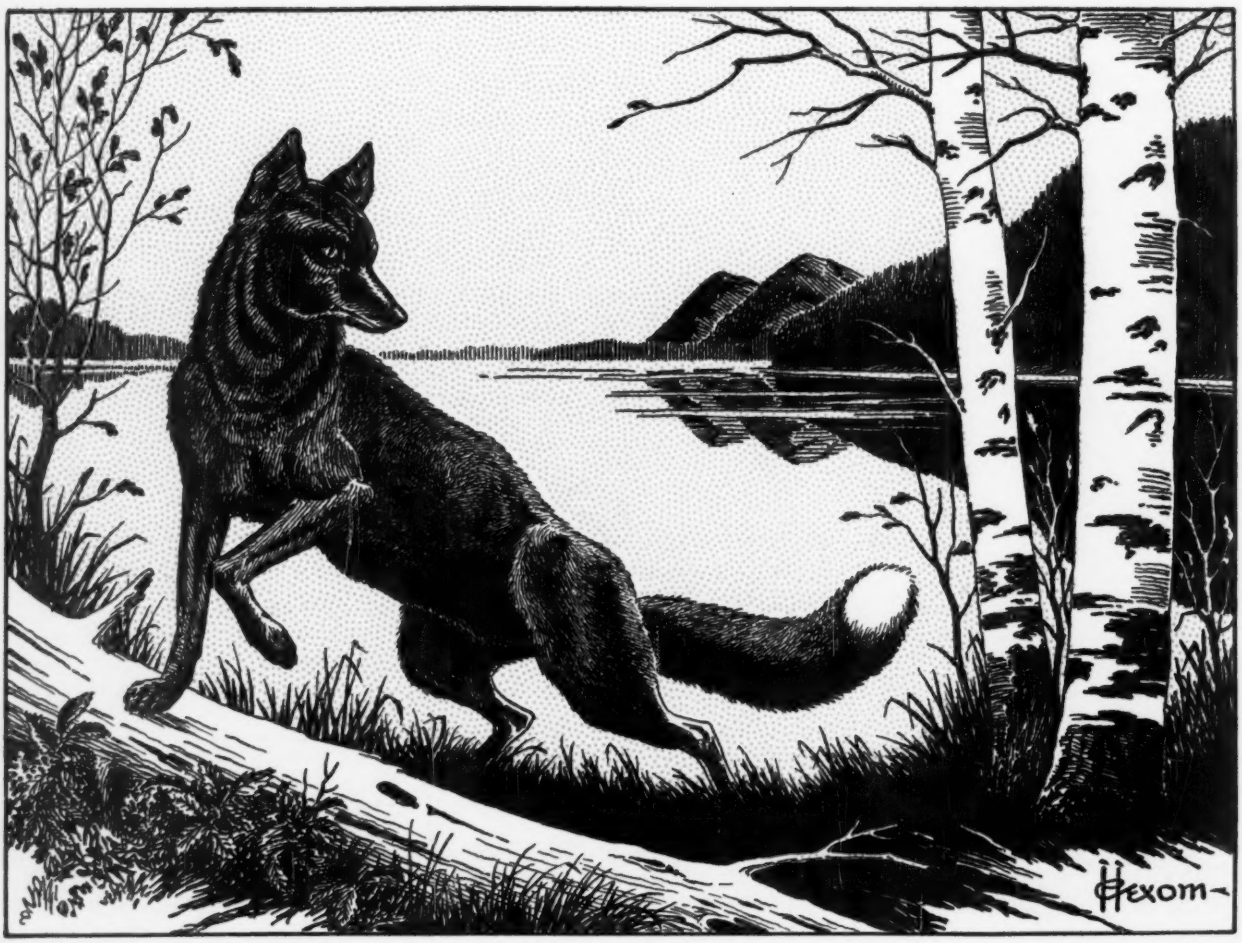
Nature Magazine

NOVEMBER
1956
VOLUME 49 NUMBER 9
60 Cents



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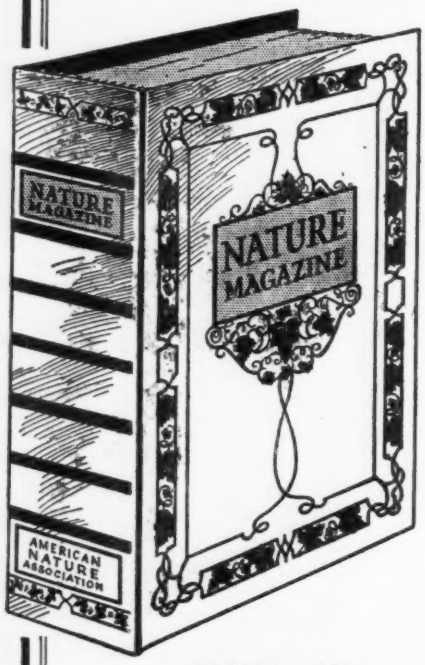

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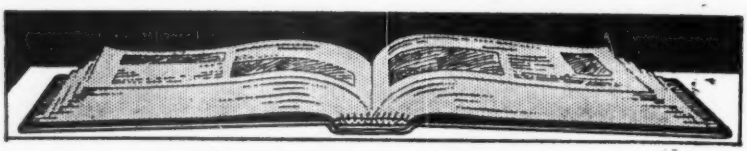

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Reviews

On Behalf of the Hunted

By Lyle Kingston. Appleton, Wisconsin. 1956. C. C. Nelson Publishing Co. 139 pages. $3.00.

This book is a hard-hitting plea for realistic, modern conservation freed from old prejudices and outworn ideas. The author writes against a background of long and alert acquaintance with the wild and its creatures, including man. He enters a strong plea for the finned, the furred and the feathered, and for recognition of the importance of the soil, the waters and the forest in their welfare. He espouses a "forward look in outdoor management." We were particularly interested in one point that he makes—and that we have made on many occasions—when he asks who first tied conservation to license fees. Conservation benefits, he asserts, are for all the people and conservation expenses should come from general State funds. He urges the reduction of the killing power of guns and fishing tackle if our wildlife is ever going to withstand the pressures of human populations. Here is a book that will probably arouse the condemnation of old-timers and many uniformed among the not-so-old-timers, but the author's arguments are difficult to deny. We trust that Mr. Kingston's views will be widely pondered. R.W.W.

Common Exotic Trees of South Florida

By Mary F. Barrett. Gainesville, Florida. 1956. University of Florida Press. 414 pages. $8.50.

Along with the Florida Keys, the southern half of the State of Florida is the growing place of many exotic trees from tropical and sub-tropical climates. They mingle in the habitat of native species in this large "arboretum." Knowing these exotics—or at least the more common of them—is a considerable botanical task, but an interesting one both botanically and geographically. Here, then, is a guide to the arboreal settlers from overseas, the answer to the often-asked question in Florida; "What is that tree?" This is not a superficial, purely popular guide but strikes a proper mean between information for the more botanically minded and for the person more casually interested in trees. Suffice it to say that the trees considered come from far and wide.

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SUBSCRIPTION RATE

NATURE MAGAZINE is published monthly, October to May, inclusive, bimonthly, June to September, inclusive, by the American Nature Association. Entered as second-class matter May 31, 1927, at the post office at Washington, D.C., U. S. A., and accepted for mailing purposes at the special flat rate of postage provided for in the United States Postal Act of October 3, 1917, and February 28, 1925. U. S. and Canada one year, $5; foreign, $.50 extra; two years, $9; life, $100.

Publication and Editorial Office, 1214 16th Street, N. W., Washington 6, D. C. Additional office of publication, Easton, Pa.

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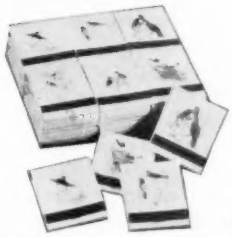

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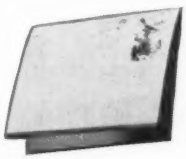

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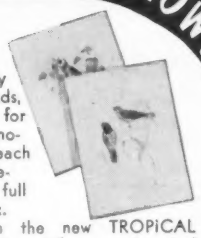

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Nature IN PRINT

By HOWARD ZAHNISER

Anticipating Wilderness

ONE GREAT DAY LAST AUGUST when my wife Alice and I were walking the West Fork Trail in the Bob Marshall Wilderness Area in Montana's Rocky Mountains we were surprised and delighted to see ahead of us two other wilderness travelers. With their heavy packs rested comfortably, they were sprawled beside the trail, enjoying the satisfactions of that beautiful morning after the night's storms, which they had endured high along the Chinese Wall. Climbing ourselves toward the wall, we could visit only briefly—until our own party overtook us and our new acquaintances went along in their opposite direction. But we chatted long enough to know that these two hardy young back-packers—Charles Allen and Robert Pond—were concluding an outdoor vacation experience that would have values which would endure for many years, perhaps forever.

Charles Allen and Robert Pond told us with some enthusiasm that this was a wilderness excursion that they had been planning for four years. Much of the pleasure had been in the planning, and a large measure of the joy on the long hike itself was in its fulfillment of many hopes, and its discoveries, also, of unexpected conditions. For us it was much the same. For three years we had planned for and hoped for the summer opportunities that we were even then realizing.

After our own plans had been made in general, the wilderness we would visit selected, the route we would travel from Washington, D.C., chosen, there came to us three newly published volumes from Harper and Brothers that proved both useful and interesting in our final planning. We would have enjoyed them more had we had them earlier. All three written by George and Iris Wells, they are practical handbooks for those who want to know where to camp on automobile trips and where to travel for wilderness vacations.

Living under canvas

"Mr. and Mrs. Wells," their publishers inform us on one of their book jackets, "have made auto camping trips through most of the United States and much of Canada, using weekends and summer vacations for the purpose. In 1953 they devoted a full year to living under canvas. A car-top carrier bore their custom-made tent and furniture for fixed camp, while they made do with pup tent and other gear between major objectives."

Thus informed through their own personal observations as well as with the data collected from various sources, they have written and compiled three volumes of signal value to the increasing number of people who are using vacations as opportunities to camp and travel. First the Wellses prepared *The Handbook of Auto Camping and Motorist's Guide to Public Campgrounds*. This they followed with *The Auto Camper's Guide to Canada and Directory of Campgrounds*. Still more recent is *The Handbook of Wilderness Travel*, a much more ambitious volume, the first work of its kind and comprehensiveness to be published.

What indoor relief from the pressing requirements of our fast-moving civilization with all its personal urgencies could be better than the winter-evening pleasant occupation of choosing a wilderness (or wildernesses) for a coming summer vacation, selecting routes of travel to or from for optimum enjoyment of the rural loveliness of our landscape and the bright wonders of our cities, and then arranging a sequence of auto-camping campsites where the outdoor vacation can start the first night away from home and continue until the return, without the interruption of indoor accommodations and the troublesome adjustments they require of outdoor folks? "Live out of doors during your whole vacation, right in the midst of the attractions which brought you out on the trip in the first place." The very prospect of this vacation way of living, with its informalities, its daily sweep of the varied landscape, and its evening (and morning) closeness to the good earth, would be a beautiful winter refreshment, and the benefits of early planning certainly would be appreciated whenever the days of the trip arrived. As the Wellses themselves have found, "much of the fun of auto camping lies in the planning and anticipation of a trip."

Places to camp

On our own auto-camping trip, to and from the wilderness, we knew we wanted to camp first in the Adirondacks along the Sacandaga River and then in Ontario's Algonquin Provincial Park. Both these, we noted, were listed by the Wellses, with interesting details regarding the Algonquin area. In between these wilderness-frontier campsites—too far apart for even a long day's journey—we knew of no campgrounds and thus welcomed the listing in *The Auto Camper's Guide to Canada:*

"MUSKRAT LAKE (6 [acres])—235 miles N E Toronto on Hy. 17 (at Cobden). Small but well developed park on terraced bluff overlooking Muskrat Lake.

"*Camping* (10): Developed. Steep for trailers.

"Recreation: Fishing (bass, pike). boats, fair swimming.

"Address: Division Engineer, Div. 9, Dept. of Highways, Ottawa, Ont."

Similarly we welcomed information in *The Handbook of Auto Camping* regarding campsites in the United States, for example, in North Dakota:

"TURTLE RIVER (475 [acres])—20 miles W Grand Forks on U.S. 2. Heavily wooded section used partially as a wildlife sanctuary. Principal feature is the Turtle River which has cut a deep channel in the bed of the old glacial Lake Agassiz.

"Camping (6): Developed.

"Recreation: Swimming pool, beach, trails.

"Address: Arvilla, N.D."

Thus the various campgrounds are noted and described as "highly developed," "developed," "permitted," or "primitive." This annotated guide is a Part II of each volume.

Information and inspiration

Part I in each of these auto-campers' books discusses the various kinds of areas where campgrounds are available, and in a dozen separate chapters of interesting writing af-

fords general information and inspiration. In the book on the United States an introductory chapter entitled "Flight from the City" contrasts a "contented camp scene with the regimentation, the stomach-tightening tensions, the blaring horns, squealing brakes, hectic rush, and gray pavements of urban life." Other chapters deal with "The Week-end Camp," "The Traveling Camp," "The Fixed Camp," "The State Parks," "The National Forests," "The State Forests," "The National Parks," "Health Out of Doors," "Planning a Trip," "Tips for Better Camping," and "Ethics for Auto Campers."

A baker's dozen of similar chapters comprise Part I of the Canadian volume, which also includes a Part III. "Directory of Hotels, Lodges, and Cabin Camps."

Hoping that the readers of *The Handbook of Wilderness Travel* will have "as pleasant an experience as was the task of writing it," the Wellses conclude their preface with the good wish: "May you have many exciting journeys, whether you make them in fact or in fancy," and their wish seems a reasonable one indeed. They both describe and help to further a "heightening interest in primitive lands." It was this interest, they write, "which inspired us to write this book, to attempt for the first time a comprehensive guide to all of America's wilderness areas, combined with a completely modern approach to the problems of traveling within them." After an introductory chapter on "Wilderness Holidays," they discuss various ways of wilderness travel and the various kinds of areas preserved as wilderness. In Chapter 2 they describe back packing as "simplest and most economical" and "also the most delightful." Other chapters deal with "The Pack Trip," "The Canoe Trip," "The Float Trip," and "Other Methods of Travel."

Methods of travel

This chapter on other methods includes accounts of jeep trips, outboard cruising, swamp-buggy trips, air-boat trips, and airplane trips, an inclusion in this volume which some of us will regret—especially in view of what seems to be a creeping tolerance for exceptions in some areas still known as "wilderness" yet supposedly suitable for use by airplane, motor boat, or jeep. The Wellses have tried, as they say, "to encompass all tastes by defining as wilderness any area which is roadless and without human habitation, or which very nearly meets these criteria." For the purposes of making more inclusive such a volume as they were planning such a definition may, of course, be justifiable, but linked with a tolerance for certain kinds of motor transportation it could prove unfortunate if it should influence the standards for preserving areas as wilderness.

In a chapter entitled "The Modern Wilderness" the Wellses characterize the Federal lands, State lands, Indian lands, private lands, and water tracts that still possess what they call "the one important quality, absence of 'civilization'."

The body of this volume, thus prepared for us, is "a complete directory of wilderness and near-wilderness areas throughout the United States, arranged alphabetically according to areas." Including thus "near-wilderness areas" and selected in accordance with the Wells' definition, this directory is all the more useful and interesting as including the more areas, a total of 371. For this we can be thankful—and safely so if we keep clear our thinking with regard to our preservation purposes, recognizing that in some circumstances there can be a deeply significant difference between wilderness" and "near-wilderness."

If Charles Allen and Robert Pond planned four years for the wilderness hike that we found them enjoying, surely a winter ahead is none too soon to begin enjoying the sort of selecting and planning which *The Handbook of Wilderness Travel* makes possible and convenient, and to indulge in the similar pleasures afforded by *The Handbook of Auto Camping* and *The Auto Camper's Guide to Canada*.

The Auto Camper's Guide to Canada and Directory of Campgrounds. By George & Iris Wells. New York: Harper & Brothers. 1955. xi + 180 pp. (5⅜ by 8¼ in.). $3.

The Handbook of Auto Camping and Motorist's Guide to Public Campgrounds. By George & Iris Wells. New York: Harper & Brothers. 1954. x + 243 pp. (5⅜ by 8¼ in.). $3.

The Handbook of Wilderness Travel. By George & Iris Wells. New York: Harper & Brothers. 1956. x + 306 pp. (5⅜ by 8⅝ in.) with wilderness area map repeated on end papers and index. $4.

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School Camping and Outdoor Education

By Dorothy Lou MacMillan. Dubuque, Iowa. 1956. Wm. C. Brown Company. 160 pages. $3.00.

The last ten years have seen a notable development in the school camp as a part of the school curriculum. It is rapidly assuming a position of real importance in education as techniques are perfected through experience. Progress has been such that it is now possible to evaluate the importance of this development, and to assemble a great deal of helpful and practical material that will aid others in school camp programs. The author of this most useful book is Assistant Professor of Physical Education in the School of Education of the University of Wyoming. Her book should find enthusiastic reception in educational circles.

The Quest of the Divine

By Alexander F. Skutch. Boston 1956. Meador Publishing Company. 440 pages. $3.50.

Distinguished naturalist and philosopher, Dr. Skutch, who has been a frequent contributor to the pages of *Nature Magazine*, here gives us a book that it is impossible to review within brief compass. Indeed, it is impossible to more than indicate that this is a volume for sober reading and for worthwhile reading. Dr. Skutch subtitles this book "An Inquiry into the Source and Goal of Morality and Religion." He draws upon his deep study of religions, ancient and modern, in his inquiry. We can do no more here than to urge the thoughtful reader to give this stimulating work the attention it justly deserves, however much his conclusions may differ with those of the author. R.W.W.

The Cape Horn Breed

By William H. S. Jones. New York. 1956. Criterion Books. 328 pages. Illustrated. $5.00.

In the days before the Panama Canal was cut across the Isthmus, sailing ships under the merchant flags of many nations beat their way around Cape Horn. Crews of these ships were a tough and hardy lot. A boy apprentice in those days, Captain William H. S. Jones, sailed in the full-rigged *British Isles*. For four years he kept a careful and detailed chronicle of his experiences. This book is based upon that record and is the story of a day now gone. Publication of his story in Great Britain brought enthusiastic response and its description as a new classic of the sea. It should be as well received here.

Briefly Noted

Hummer and Buzz. By Louise Dyer Harris and Norman Dyer Harris. Boston. 1956. Little, Brown and Company. 55 pages. Illustrated by Robert Candy. $2.50. An excellent story for children about a hummingbird and a bee and by the authors of *Slim Green.*

Crickets. By Olive Earle. New York. 1956. William Morrow and Company. Illustrated by the author. $2.00. The life of the cricket told for the younger reader.

Azalai. By John Skolle. New York. 1956. Harper and Brothers. 272 pages. Illustrated. $4.00. Adventure and discovery among the tribes and caravans of unexplored parts of the Sahara.

Green Darner. By Robert M. McClung. New York. 1956. William Morrow and Company. 48 pages. Illustrated by the author. $2.00. The quite young reader meets the largest dragonfly of the meadow pond.

Penguins. By Louise Darling. New York. 1956. William Morrow and Company. 64 pages. Illustrated by the author. $2.00. A Morrow Junior Book about these always interesting birds.

The Trickster. By Paul Radin. New York. 1956. Philosophical Library. 211 pages. $6.00. A study in American Indian mythology.

Clouds, Rings and Crocodiles. By H. Percy Wilkins. Boston. 1956. Little, Brown and Company. 148 pages. Illustrated by Anne Marie Jauss. $3.00. A voyage by rocket through space and among the planets.

Insects and Spiders. By C. P. Friedlander and D. A. Priest. New York. 1956. Philosophical Library. 124 pages $2.75. A book of keys with biological notes, covering about 100 families of insects and 70 genera of spiders.

The Magic of Sound. By Larry Kettelkamp. New York. 1956. William Morrow and Company. 64 pages. Illustrated. $2.00. A Morrow Junior Book that acquaints the younger reader with the story of sound.

Arctic Bush Pilot. By Bud Helmericks. Boston. 1956. Little, Brown and Company. 180 pages. Illustrated. $3.00. A story of flying where skill and intrepidity are at a premium.

Contents noted BY THE EDITOR

FAILURE OF KEY DEER PROTECTION was one of the disappointments of the 84th Congress. The House had passed the bill that would have established a 1000-acre Key Deer National Wildlife Refuge to protect the remnant population of North America's tiniest deer. The bill was reported out of committee to the Senate and placed on the consent calendar. The bill was introduced and fostered by Florida's Representative Charles E. Bennett, but it was killed in the Senate upon the objection of Senator George Smathers at the request of Representative Dante B. Fascell, both of Florida. Local real estate interests appear to have tossed the monkey wrench into the works at the last moment. Thus the future of these little animals continues to be clouded by a few selfish individuals with political influence.

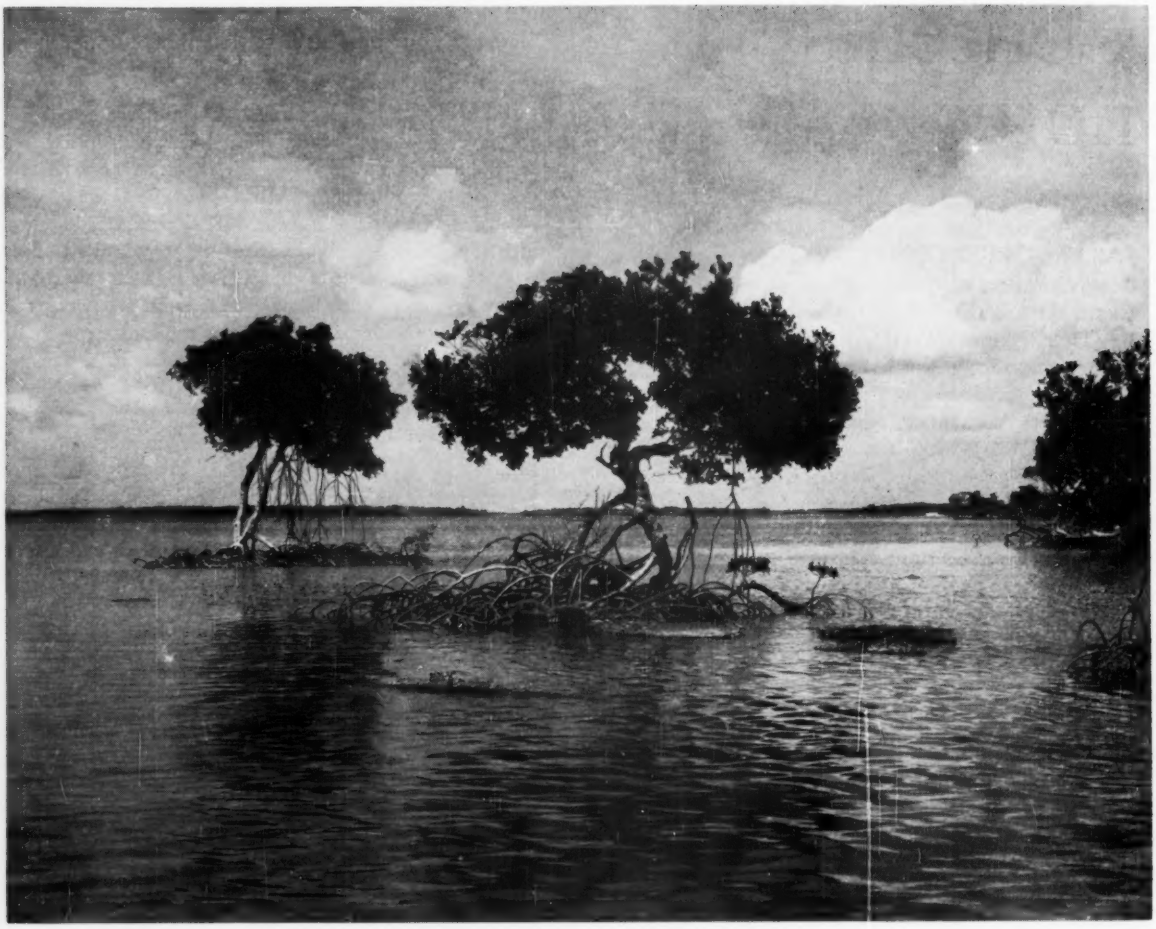
THREE YOUNG BLUEJAYS FELL FROM THE NEST in a tree, according to a news story from Chester, Pennsylvania. One was run over by an automobile, one was injured, and the third disappeared. The householder in whose tree the mother jay was trying to bring up her family picked up the injured bird, the mother diving at his head in an attempt to protect her remaining youngster. The bird also was reported to have attacked a neighbor, who called a doctor to attend to her injuries. The frantic mother bird dispersed a half-dozen other persons during a half-hour period. The police were called and a patrolman borrowed a small calibre rifle and shot the mother jay, thus destroying this terrible menace and restoring order and safety to the community. We wonder how many humans would attempt to fight a monster outweighing them more than two hundred to one?

STATISTICS ON VISITS TO STATE PARKS shed interesting light upon the importance of these recreational areas, and upon the outdoor-going activities of the American people. The National Park Service recently issued its annual survey of State Park operations in 1955, revealing that 183,187,643 visits were made to 2034 such parks administered by 83 agencies in 46 States. This was an increase from 166,760,369 visits, or ten percent, compared with 1954. It was also a rise of more than sixty percent since 1950. Nine States—California, Illinois, Oowa, Michigan, New York, Ohio, Oklahoma, Oregon and Pennsylvania—reported more than five million visitors in 1955. The survey also showed important increases in the use of overnight accommodations in these areas, including a rise of 19 percent in tent and trailer camping. Expenditures by State park agencies totalled $55,093,278 in 1955, a twelve percent increase in one year. The 2034 State parks surveyed embrace a total of 5,085,951 acres.

A BILLION BOARD FEET OF LUMBER is something we have never been able to visualize, much less thirty-seven billion board feet, which is what the American Forest Products Industries tells us was the United States' lumber production last year. This is a steady figure now, and more than one third of the world's output. About ninety percent of this lumber was harvested from privately owned commercial forest land. According to AFPI's report, in the early days of the lumbering industry only thirty percent of each tree was utilized; now there is said to be a seventy percent utilization, which is encouraging. We were interested to learn that more than 1000 professional foresters are employed by the lumber companies, and that some forty million acres of private forest land operate under the American Tree Farm System of timberland management. To round out the statistical picture, full-time employment in the lumber industry is afforded to more than 750,000 persons and products shipped by the lumber industry were valued at more than five billion dollars. If there is any further questions, class, AFPI will have to answer them.

ONE HUNDRED TRUMPETER SWANS were probably vastly surprised by being fluoroscoped, as we would have been if we were a trumpeter swan. And we are quite happy we are not, because the instrument revealed that thirteen out of the hundred were carrying lead pellets in their tissues, although these birds are on the totally protected list. The U.S. Fish and Wildlife Service charitably observes that this evidence of hunting pressure was no doubt due to gunners mistaking the birds for snow geese or some other species. We would be inclined to suggest that the tendency of some gunners to shoot at anything on the wing might have accounted for no few of the pellets. However, the Service, having discovered this evidence of target practice on the swans, is trying to devise means for greater protection of the trumpeters on their wintering grounds. With a nod to another even more reduced species, the Service has closed to hunting more than 4500 acres of land and water adjoining the Aransas National Wildlife Refuge in Texas, where the little band of whooping cranes spend the winter.

MOUNT RAINIER WAS HAVING ITS MEASUREMENTS TAKEN. This announcement kept us in a state of apprehensive suspense lest modern methods of survey lop several hundred feet off the peak's official height. We were, therefore, vastly relieved to learn that the surveyors found that the mountain long had been shortchanged to the extent of two feet, its official altitude at Columbia Crest being now officially 14,410 feet instead of 14,408. In case you get asked the question on a quiz program, it is the fourth highest peak in Continental United States. R.W.W.



Red mangroves starting the birth of infant islands in the Ten Thousand Islands area of Florida.

The Trees that Walk to Sea

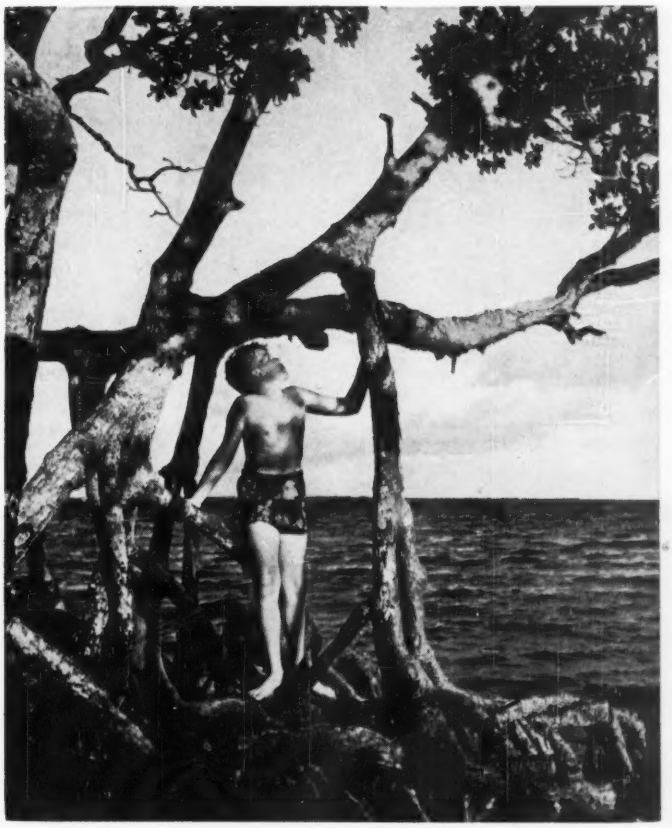
ALONG some of the sheltered beaches and shoals of Miami's Biscayne Bay, and fringing the many island keys that lead southwesterly to Key West, one can glimpse some of the most unusual among trees. These are the mangroves—"the trees that regularly walk to sea."

No forest is more weird or grotesque than a so-called "mangrove swamp." It is Nature's original Jungle Gym. Each mangrove tree is surrounded by a mass of curious prop roots, which grow down from the main trunk and lower branches, tying them firmly to the soil. Submerged regularly by the tides, these roots often become encrusted with oysters, hence the unusual but true tales of plucking oysters from trees. Rope-like air roots, as well, often dangle from the upper branches, eventually penetrating the tidal mud or marl below. This strange combination of living stilts enables the mangrove to "walk"—over an extended period of time, to be sure—into the sea.

Mangroves are really tropical trees and cannot endure killing frosts. It is the warm Gulf Stream that protects Florida's mangroves. However, farther south on the Peninsula, especially from Cape Sable to the Ten Thousand Islands area, mangroves really come into their own. In fact, Florida can boast of more than a thousand square miles of fringing mangrove swamps. But tens of thousands of square miles of mangroves inhabit the sea margins elsewhere in the tropical world, from the Caribbean borderlands to Africa, and from there across the Indian Ocean to the myriad islands of the vast Pacific. During World War II, many American servicemen came face to face with mangroves the hard way, storming through these almost impenetrable thickets as a part of amphibious assault on the insular strongholds of an entrenched enemy.

By HENRICKS HODGE

Photographs by the Author



The prop roots of Florida mangrove contort themselves into Nature's original Jungle Gym.

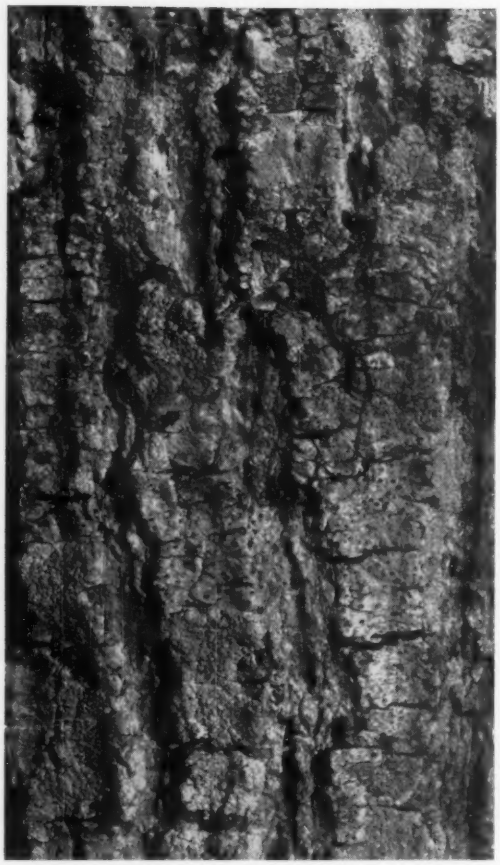
Star-shaped, yellow flowers of the common red mangrove.

The name mangrove most properly pertains to trees of the Mangrove Family, the Rhizophoraceae. One or more species of this family occur in nearly all mangrove swamps wherever they are to be found. Other trees, quite unrelated, mimic true mangroves in habit, grow with them in these seaside swamps, and by these tokens are also called mangroves. The commonest true mangrove of Florida and the Caribbean is the red mangrove, *Rhizophora mangle*, but there are other familiar American species such as the black or honey mangrove, *Avicennia nitida*, and the white mangrove, *Laguncularia racemosa*.

Mangroves and mangrove-like plants share the unique habit of being able to thrive even though their roots are submerged in sea water, whose salty brine is notoriously lethal to most land plants. Prolonged flooding by fresh water is sufficient to kill most trees by suffocating the living tissues of the root. Regular daily flooding by salt water is another matter, and trees growing in such a medium are in exactly the same situation as the sailor with "water, water everywhere, but not a drop to drink."

Although surrounded by water, with roots bathed in it almost continuously, mangroves are continually "thirsty" for the fresh water that they require. Like desert plants, they are threatened constantly by drought. But this is not desert drought where there is no water. The drought experienced by mangroves is what scientists call "physiological drought." Water is present but, because of its heavy salt content, it cannot be imbibed by the roots of the plant. All the curious structures associated with mangroves are related to these extreme conditions of life found at the sea margin. Like desert plants, mangroves conserve moisture in special ways. For example, the attractive green leaves are wax-covered and thickened, and under a microscope they would show much similarity to the leaves of desert plants.

The abundant stilt roots of the common red mangrove have a double purpose. They anchor the tree firmly on the unstable, shifting mud of tidal areas, and they also may act as a sort of living air-hose, permitting gaseous interexchange to the underwater parts of the roots. Believed to have a similar air-catching purpose are the curious, asparagus-like "pneumatophores," which rise from the submerged horizontal roots of some mangroves.



Red mangrove bark is rich in the tannin material used by the world's leather industries.

The problem of reproducing their kind has been beautifully resolved by the mangrove fraternity. Think of the job of planting a seed on mud flats that twice daily are washed bare by tidal water. The red mangrove has solved this problem. Instead of sowing seeds, this tree sows seedling plants! Seeds dropped into the water would float away, or, at ebb tide, would have no time to germinate. A seedling plant, with roots pre-formed and already growing, has a better chance of getting a root-hold in the shifting soil.

Watch what develops from the attractive clusters of yellow, star-shaped flowers. First to appear are curious fruits like small green pears. Instead of simply ripening and falling, the fruits hang on the parent tree for months. Within, the single seed is already sprouting, eventually to push out a thick tap root needed to attach the young plant to the soft mud below. The spear-like root is beautifully adapted for plummeting into the mud when the time comes for the youngster to be separated from its parent tree. At that time the seedling may have attained a length of twelve inches or more, although a fruiting tree usually shows seedlings in all stages of germination. Like those animals that bear their young alive, plants whose offspring are produced as germinating seedlings are termed "viviparous." Mangroves are good examples of such plants, and a single tree may produce 300 viviparous seedlings during a single season.

With extraordinary luck a seedling mangrove may fall to become successfully anchored in the mud below. However, in most cases, although fitted for just such a thing, the seedling will land in water and be carried away by the tide. But the young mangrove is noted for its ability to take long ocean voyages and still retain its

Curious growths called pneumatophores rise from the submerged, underground roots of the black mangrove.

viability. During the fruiting season, the flotsam and jetsam of tropical seas may be laden with such arboreal voyagers. Many are driven ashore by wind or tide. Five hundred and twenty-eight seedlings were counted on a 500-yard-long strip of beach at St. Petersburg, Florida, following a single storm. Floating seedlings gradually become waterlogged. The heavier root tip is the first to sink, and so, as it is washed into shallower waters, the seedling is in the proper vertical position to strike rapid root. The stimulus of touching ground apparently sets the root into active growth, and the growth of the seedling thereafter is unusually rapid. An East African mangrove seedling is reported as growing twenty inches in as many hours, a rapidity of development surpassed by few other plants.

Like miniature "Kon-Tikis," mangrove seedlings have been rafted across the oceans to found new colonies on far distant shores. Long before the voyages of Columbus, or any of his predecessors, red mangrove seedlings had conquered the Atlantic. Because of its propensity for travel, the common red mangrove is found on both sides of the Atlantic, while closely related species range widely from tropical East Africa to the far Pacific.

Mangroves are the original reclaimers of land. At the same time, they serve as Nature's own breakwaters, protecting the sheltered shorelines of the tropics from the relentless sea. Because of the incessant restlessness of the tides and the profligate productivity of mangrove trees, seedlings are continually being floated across new shoals, bars, or mud flats as quickly as they form. Striking root, these juvenile pioneers act as reconnaissance patrols, in time enabling the main mangrove forest to migrate farther seawards.

Firmly rooted reconnaisance patrols of tiny seedling mangroves advance into the sea.

As the tiny treelets grow, their developing prop roots interlock and entangle in such a way as to act as "catch-alls" for sediment, floating debris, or shifting sand. Adjoining thickets of pioneer trees soon grow together to form larger ones, and eventually wooded islands appear. With a continuing accumulation of detritus, land is built up on which other trees, and even man or land animals, can pioneer. Engineering projects have taken advantage of the soil-holding ability of mangroves. When the present Overseas Highway to Key West was laid down as a railroad by the Florida East Coast Railway, mangroves were planted to protect the railroad ballast from the erosive action of the sea That this original undertaking still stands after nearly half a century is ample proof of the help given by these strange trees.

Starting first as a low thicket, mangroves, under favorable conditions, may eventually develop into tall, pole-straight trees. In the tropics, especially, mature mangroves often attain a height of one hundred feet with trunks two to three feet in diameter. Quite naturally trees of such dimensions are of commercial value. The hard wood of the red mangrove is exceedingly durable, being resistant to both insects and decay. Thus it is often used as piling, as well as in local construction, and as a readily available source of firewood. Since early times Moorish seafarers have regularly carried mangrove poles in their sailing dhows from East Africa to Arabia for new building purposes.

Today mankind finds mangroves of greatest economic use as a source of tannin to convert his crude animal skins into leather. The first record of the use of mangrove bark for this purpose dates from the year 1230 A.D., when Moors on the coast of Arabia noted that this bark would tan leather. In the 18th Century it was found that West Indian leather made from the bark of the red mangrove was superior to the oak-tanned leather of England. Nowadays mangrove bark extract is prepared in nearly all the widespread places where these littoral trees are found—in Madagascar and Mozambique, Tanganika, Borneo, Indonesia, India and Panama. Unlike the sources of most vegetable tannins, which are rapidly being depleted, mangroves still exist in seemingly inexhaustible numbers, and so the use of their bark will undoubtedly continue to grow. (*continued on page 500*)

One of the immigrant egrets shown in the association that gives it the name of cattle egret. Alexander Sprunt, Jr., remarks that: "The close proximity maintained by the bird to cattle is little short of astonishing."

The cattle egret, now thriving, arrived here mysteriously as an

Avian Immigrant

By E. JOHN LONG

Photographs by J. A. Grimes

SOMETHING of an ornithological miracle has been taking place in the Western World during the past quarter of a century, and the strange part about it all is that bird students, and even professionals, were virtually unaware of what was going on.

Call it "oversight," or "mistaken identity," or whatever you will, the fact remains that the cattle egret, a heron family member that is quite widely distributed over Europe, Africa and the Middle East, has been in our midst for some time apparently without attracting much attention. Or, when it was observed, it was mistaken for a snowy egret, or possibly a young little blue heron, which has white plumage.

Perhaps the cattle egret, whose other names are cow heron and buff-backed heron, was able to slip in without recognition or fanfare because it is contrary to all precedent that it should do so. At no other time in history, in fact, has a new bird appeared on the continent of North America and become well established as a breeding species without man's initial assistance.

In other words, "This just couldn't *happen*!" say the experts who did not spot it for so long. To which the answer is: "Ah, but it *did*!"

Let us start at the beginning. The cattle egret, *Bulbulcus ibis*, has been a familiar resident of the Mediterranean region for many, many years. It is also known as something of a wing-loose wanderer, having extended its range southward to South Africa, north to Iceland, and east to Iran. A related sub-species, *Bulbulcus ibis coromandus*, dwells in the Orient, from India to Japan and Australia, but does not come into our North American picture.

Just exactly where or when the cattle egret made its New World debut is not known, although there are authenticated reports of it being seen in South America as early as 1930. The first actual specimen was obtained in British Guiana in 1937.

At first it was assumed that the small flocks noted in northern South America were descendants of escaped birds that had been brought over by ship. Some thought the cattle egret might have been there all the time, but had been overlooked. While herons are known to have been carried to South America by Orientals as pets, it seems more likely that these would be fish-eating varieties. The cattle egret likes *live* insects, which would be difficult to stock on long voyages. There is no record of a zoo importing any of the birds in quantities. As for escaping observation entirely, it is possible, but unlikely.

When the cattle egret first arrived it seems to have been mistaken for a snowy egret (left), or for a young little blue heron, which has white plumage. The cattle egret is shown above at the right.

The most widely accepted explanation today is that a few pairs may have blown over the Atlantic from Africa during a period of heavy storms. Considering the cattle egret's traditional wanderlust, a sizeable flock might even have followed Greeley's advice to "go west," en masse!

For many years no one was able to locate its nesting sites. It was assumed that the cattle egret was not a bird of the mangroves or coastal mud flats, because it did not eat fish like other herons, and that its nest would probably be found in some inland or freshwater marsh. This later proved to be correct.

Nor does anyone know exactly when the cattle egret moved northward into the United States. First observation of it, near Clewiston, Florida, went officially unrecorded because the man who saw it considered the bird an escapee! Willard E. Dilley, now on the staff of the Grand Canyon National Park, recalls that he noted two birds during "the summer of 1941, but it could have been the summer of 1942." He thought no more about it until later years, when scientists had begun a case study.

It was not until 1952, when the cattle egret had become somewhat numerous in Florida, and had been observed along the Atlantic Coast as far north as Newfoundland, that ornithologists of the country really awoke to the amazing situation that North America had a new resident bird species, and that apparently it was here to stay! Suddenly bird watchers began to take closer looks at feathered creatures close to grazing cattle; birds they had previously dismissed as white herons, or possible snowy egrets.

The first good photographs of cattle egrets in this country were taken, oddly enough, by a bird student who did not realize that he had history on his film. The man was Richard Borden, and he believed he was getting some pictures of white herons and snowy egrets among the cattle of Eagle Bay Ranch, near Lake Okeechobee, in March, 1952. Imagine his surprise, upon examining his prints several months later (when reports of cattle egrets were coming in), to find that he had evidence that the bird was present in Florida in large enough numbers to indicate that it was now nesting.

And sure enough, on May 5, 1953, a memorable day in American ornithology, Samuel A. Grimes and Glenn Chandler found the first cattle egret nest in North America. It was on an island called King's Bar, in Lake Okeechobee, about three miles off the mouth of the Kissimmee River, which flows into the north end of the lake. The nest held only one egg, but it was proof enough that a bird immigrant had been oriented, and *of its own free will*. A new species thus was added to the breeding avifauna of a continent.

Audubon Society members and other bird students were soon spotting the cattle egret in ever increasing numbers. More nests were found, some with three or four eggs, and usually congregated with other herons. In fact, the new arrivals seemed to be getting along well

Two cattle egrets. It is not known exactly when these birds first came to the United States, but by 1956 it is estimated that it has increased to at least 6500 birds.

with such old inhabitants as snowy egrets, limpkins, anhingas, boat-tailed grackles, little blue and Louisiana herons, gallinules, and others. At least, no conflicts were observed, although cattle egrets built their nests close to other nesting birds of the Okeechobee area.

It is fairly obvious that the cattle egret is well-established, otherwise it could not have increased as rapidly as it has. The growth of the colonies of these birds in Florida, any way you look at it, is phenomenal. Undoubtedly there have been some new arrivals from South America, but most of the present flocks must surely be "native sons." In a little more than a decade and a half following the first reported sighting of cattle egrets in Florida, they increased from a few birds to an estimated 1956 population in excess of 6500.

Considering that the cattle egret has also been reported in Louisiana, South Carolina, Virginia, New Jersey, New York, Massachusetts, Maine, and even in Newfoundland, plus a rumor of one in the Chicago area, observers elsewhere should be on the lookout for it.

Recently the Smithsonian Institution issued a special paper entitled "The Spread of the Cattle Egret," by Alexander Sprunt, Jr., of the National Audubon Society. This contains detailed observations of the bird in its new environment. The first clue to identification, Mr. Sprunt advises, is that the cattle egret resembles a snowy egret with a yellow bill.

"Any really good look at the bird, however," Sprunt adds, "will at once reveal that the beak is short, stout, and stubby, in comparison with the slender and longer black beak of the snowy egret. The entire plumage is white, with the adult showing the orange-buff on crown, neck, upper breast and back. The legs are dark in the immature, yellowish in the adult."

Here is how the cattle egret got the first part of its name, according to Mr. Sprunt:

"The close proximity maintained by the bird to cattle is little short of astonishing. It is a positive wonder that they are not stepped on! It keeps pace with the animal continually, usually close by the head but sometimes near the fore or hind feet, and occasionally under the belly. When an insect is disturbed, the bird darts out, secures it, and returns, Now and then, it reaches up and picks off something from the body of the cow, or its legs. Whether these tidbits are flies, ticks, or what, I do not know, but it is a frequent practice. At times, the cow may be seen to push the bird aside from its muzzle, but appears not to object otherwise to the immediate closeness of its satellite."

The bird's instinct to be near something that stirs up insects led to disaster for one that had been frequenting the shoulders of a Florida highway, and feeding on insects disturbed by passing cars. This one did not see "the car behind," apparently, and was struck and killed—an unhappy example of "adaptation to conditions" that went astray!

For the advanced student of ornithology, the cattle egret offers some strange and challenging behaviorisms. Take, for instance, its unexplained habit of weaving the head and neck from side to side.

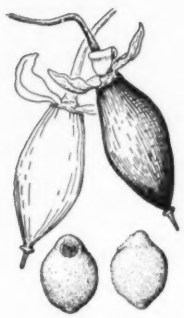
"It is a most interesting bit of behavior to watch," Mr. Sprunt reports. "A bird will suddenly stop feeding, stand perfectly upright, and weave the upper part of the body in a sort of hula-like motion. After a few of these movements it resumes feeding. This habit has never been witnessed in any native herons of this country in the writer's lifelong experience with all of them."

When the bird is standing or walking among feeding cattle its position is erect, but in flight the cattle egret's neck is carried in the usual heron (*continued on page 500*)

An innocent-looking vine of tropical America is

The Devil's Morning Glory

By RICHARD EVANS SCHULTES



Drawing of the fruit and seed of the narcotic morning glory.

WHO WOULD ever have thought that a narcotic lurked amongst the morning glories? Fantastic? Yes, but that is really the case with the *ololiuqui*. And such a hold did this narcotic have over the Indians of Mexico that it drove the early missionaries nearly to distraction.

Once a widely used sacred plant amongst the Aztecs and other peoples of central Mexico, ololiuqui has now been forgotten, except in the far-off mountains of Oaxaca. There it still holds the reverence of the natives and is considered a medicine of divine power.

The first white man to write about this plant was none other than Francisco Hernandez, personal physician to King Philip II of Spain. Dr. Hernandez came to Mexico himself and made a truly encyclopedic study of the medicinal plants, animals and minerals of "New Spain" between 1570 and 1575. The Indians told him about the wondrous power of ololiuqui, and he faithfully jotted it all down in Latin and made a drawing of the plant. He listed many of its supposed virtues and, last of all, he said that when the Aztec priests wanted to commune with their gods and receive messages from them, they ate the plant to bring on a delirium, during which a thousand satanic hallucinations appeared to them.

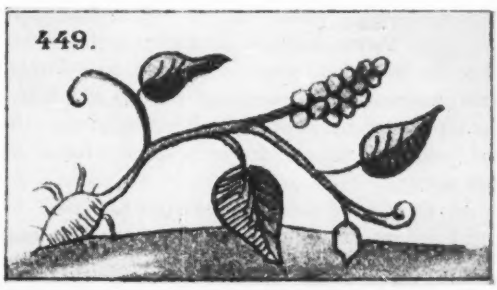
The Spaniards had so much fear of ololiuqui's insidious power that one of the editors of Hernandez' notes tried to fight the drug by withholding information. He said: "it will not be wrong to refrain from telling where it grows, for it matters little that this plant be here described or that Spaniards be made acquainted with it."

But the plant was there and it was hard to hide it. Many Spanish divines warred against the craft of the devil as he worked his will through the little round seeds of the innocent-looking, white-flowered morning

The morning glory, *Rivea corymbosa*, of tropical America looks quite innocent, but its narcotic properties drove early missionaries to distraction.

glory, which we now call *Rivea corymbosa*. Padre Sahagun, under whose direction an Aztec seminarian made a crude drawing of the swollen-rooted vine, told how the natives give the seeds in a drink to harm an enemy. The only good thing he could say of the drug was that the seeds in poultice form helped relieve rheumatism.

It was Father Alarcon, however, who really took up the cudgels to break the power of the satanic little vine. Telling how ololiuqui had its own special deity, he ranted on at great length: "It is remarkable how much faith these natives have in the seed, for, when they drink it, they consult it as an oracle to learn. . .things beyond the power of the the human mind to penetrate. . . The witch doctor recites a thousand fabrications. . .and keeps his patient deceived. He who drinks ololiuqui to excess loses his mind. They venerate ololiuqui so much that they do all in their power so that the use of the plant does not come to the attention of the ecclesi-



Drawing of the plant for Sahagun's work on the medicinal plants of Mexico. This was made soon after the conquest. The author wrote that "this seed intoxicates and causes insanity" amongst its users.

astical authorities." Thus it had moral aspects, as well.

But the morning glory still held its sway. Finally, Father Serna, who fought tooth and nail against "idolatries," told how the Indians placed offerings to the seeds in secret places, and stored them with the idols of their ancestors. And he explained how the ololiuqui-worshipper, when arrested and questioned, would deny any knowledge of the drug, "not so much out of fear of the law as out of the veneration in which they held ololiuqui." For "they do not wish to offend ololiuqui with demonstrations before the judges of the use of the seed and with public destruction of the seed by burning." And lastly the good padre sighed that "it is not without concern that Christian priests see the ease with which the devil works amongst these people, even after they have been baptised and accepted into the church."

Now what is this all about? Botanists have asked for several centuries: "Can there be such a powerful morning glory?" The morning glory family was always thought to be one of Nature's mildest and most innocent plant families. No intoxicating principle was known in this group of beautiful ornamentals. "If it were the deadly nightshade family," botanists argued, "it would be understandable." But the morning glory is so innocent!

De OLILIVHQVI, seu planta orbicularium foliorum. Cap XIV.

OLILIVHQVI, quam *Coaxihuitl*, seu herbam Serpentis alij vocant, volubilis herba est, folia viridia ferens, tenuia, cordis figura. caules teretes, virides, tenuesq;. flores albos, & longiusculos. semen rotundum simile Coriandro, vnde nomen. radices fibris simules. calida quarto ordine planta est. luem Gallicam curat. dolores è frigore ortos sedat. flatum, ac præter naturam tumores discutit. puluis resina mixtus pellit frigus. luxatis aut fractis ossibus, & lumbis fœminarum laxis, aucto robore mirum auxiliatur in modum. S eminis etiam. est vsus in medicina, quod trium, ac deuoratum, illirumq; capiti, & fronti, cum lacte & *Chilli*, fertur morbis oculorum mederi. deuoratum verò, venerem excitat. Acri est sapore, & temperie, veluti & planta eius, impensè calida. Indorum sacrifici cum videri volebant versari cum Superis, ac respõsa accipere ab eis, ea vescebatur planta, vt desperent, milleq; phantasmata, & dæmonũ obuersãrium effigies circumspectarent. qua in re Solano maniaco Dioscoridis simulis fortasse alicui videri possit.

Reproduction of the earliest illustration of the devil's morning glory, together with detailed discussion in Latin of its uses and abuses. This is from Hernandez' exhaustive tome on the medicinal plants, animals and stones of Mexico, first published in 1651 but written earlier.

But no. Dr. Hernandez, as reliable as he was, *must* have been wrong. Ololiuqui was such a sacred plant that the Aztecs, seeking to keep such awesome knowledge from the hated foreign conquerors, must have tricked the doctor by giving him a morning glory to draw as the source of the lentil-like seeds that helped them talk with their gods. Botanists mused and guessed. Then, thirty years ago, one of our leading botanists, going so far as to mistrust the Aztec's knowledge of plants, suggested that ololiuqui must be one of the nightshades, the poisonous *Datura meteloides*, used even to-day in Mexico and our own Southwest as a ceremonial intoxicant. This suggestion was supported because the flowers of the Datura are superficially similar to those of the Rivea, and perhaps it was a case of simple confusion of the two plants.

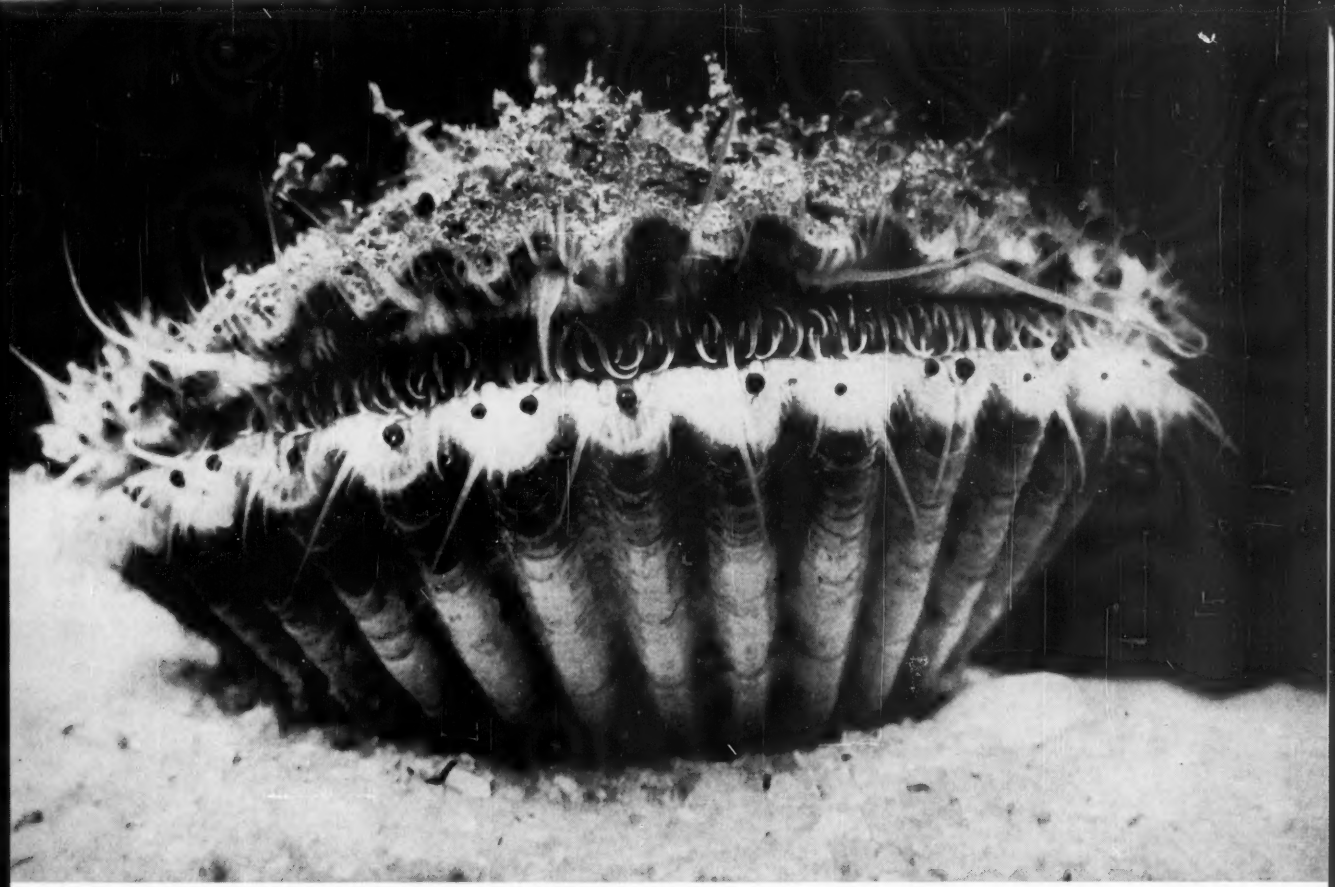
Yet there were investigators who had faith in the trustworthiness of the early Spanish chroniclers, and who refused to accept such a round-about identification. Then, finally, the devil's morning glory itself was rediscovered as a ceremonial narcotic. Field men found it hiding out in the gardens of witch-doctors in the mountains of Oaxaca in southern Mexico, where it is still revered by the Chinatecs, Mazatecs, Mixtecs and Zapotecs. In 300 years, the methods and purposes of using ololiuqui have undergone but slight changes.

All of these peoples still consider the vine as sacred, as many of their native names attest. The Zapotecs, for example, call it *la señorita*, or *semilla de la virgen* (in reference to the virgin Mary) or *bitoo* ("the god"); the Mazatecs know it as *na-so-le-na* ("flower-her-mother"); the Chinantecs refer to it as *a-moo-kya* ("medicine for communicating with the divine"). When they drink a preparation of the seeds, they must be in a lonely place, alone with the witch-doctor, and they must not even hear a cock's crow. During the sleep that the sacred seeds induce, the spirits of the plant come out and talk to the communicant, and he will learn many secrets that he wants to know. There is still a wealth of folklore surrounding ololiuqui in southern Mexico and further studies may greatly enrich our understanding of this curious remnant custom from pre-Columbian Mexico.

So the riddle of three centuries has been solved, and we know that one of Nature's weirdest narcotics dwells in the seeds of an inoffensive-looking little morning glory.

Nevertheless, we know little about ololiuqui. It may one day be a great boon to mankind as a medicine, when it is fully studied. Preliminary experiments with animals show that it has an active narcotic principle. Very recent psychological experiments have shown that the seeds are, indeed, capable of causing grotesque visual hallucinations and other mental alterations. It is interesting to learn that in Cuba, where the vine is common but where its narcotic properties are unknown to the people, honey from bees that frequent the flowers of this plant must be tested carefully lest it cause headache and dizziness amongst those who eat it. There is a possibility that they may become important tools in the hands of experimenters in the psychiatrical sciences.

In the old Spanish accounts, there are hints of how ololiuqui may become a useful medicine in modern therapeutics. Amongst the many therapeutic uses that they listed, there is one which stands out and is repeatedly emphasized—that is ololiuqui's employment as a pain-killer. As yet, we know nothing of how reliable this report is, but many of the chroniclers spoke of ololiuqui's efficaciousness as a "cure" for rheumatism. It is still used for rheumatic pains in the high cool rainforests of Oaxaca, where muscular pains are the rule. Many of the most reliable of the (*continued on page 498*)



The convex, smooth right valve upon which *Aequipecten irradians* rests is shown to be free of attachments. On the upper or left valve, a variety of small plants and animals have fastened themselves. Skeleton shrimps and other active animals often are seen browsing through this miniature "forest."

The Blue-eyed Scallop

By WILLIAM HOPKINS AMOS

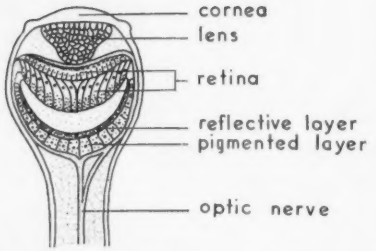
Photographs by the Author

WHAT does scallop mean to you? Is it a method of cookery, a decorative edging, a trade-mark for a major oil company, or an item on the menu! Of course, it is each of these, but, above all, a scallop is without doubt one of the world's most bizarre living creatures.

This relative of clams and oysters is found throughout the world in shallow seas. The largest and most colorful species inhabit the warm waters of the tropics. The Lion's Paw, *Lyropecten nodosus*, is one form that is highly prized by shell collectors. Our common Atlantic bay scallop, according to the taxonomy of *American Seashells* by R. Tucker Abbott, bears the scientific name of *Aequipecten irradians*, and ranges along the entire east coast of the United States.

Before 1931 this shellfish was abundant between Cape Hatteras and Cape Cod, where it was dredged in sufficient quantities to constitute a major fishing industry. But that year eelgrass, a shallow-water plant that provides organic matter for the scallop to feed upon, suffered a disastrous depletion from a type of parasitic fungus. The eelgrass soon disappeared, and with it many animals that depended upon it for food and shelter, the bay scallop included. The scallop fishery of North Carolina was reduced to only four percent of its former catch. But since eelgrass does not grow south of North Carolina, the Florida fishery in the Gulf of Mexico was not affected, and these waters continue to produce large numbers of scallops. Fortunately, eelgrass was not completely obliterated from our shores, and it is recovering gradually in northern waters. With it, we may expect a return of *Aequipecten irradians*.

A close look at a scallop indicates that it is more than a pair of shells enclosing a rather shapeless body. The two shells, or valves, are unequal, the right valve being



The eye of the scallop is a complex structure that is capable of perceiving small differences between light and shade. Its lens does not form images, but serves to concentrate the available light upon the retina. Should the light not be strong enough to stimulate the upper retina, it passes through the retinal layers, and is then reflected from a special layer back upon the lower retina. To serve the two retinas, the optic nerve must have two major divisions. (After Borradaile and Potts)

Peeping from within the convolutions of the shell are the bright blue eyes of a scallop. The arrangement of the eyes is not always regular, and their size differs considerably. From the margins of the mantle, which supports the eyes, can be seen the tentacle-like projections, some of which are sensory in function, while others strain the water flowing into the gill chamber.

←

larger and more convex. The animal usually rests upon this larger side. Consequently the left valve seldom comes into contact with the bottom. Thus the bottom valve is usually clean and smooth, while innumerable small animals and plants become affixed to the top valve. The upper surface is a good dwelling place for algae, moss animals, hydroids, worms and tube shrimps. This fact lends the scallop a certain protective resemblance to the muddy, cluttered bottom on which it rests.

The most remarkable behavioral characteristic of our common scallop is that it swims; perhaps without accuracy, but at times with considerable velocity. This ability places it apart from its fixed relatives, the mussels and oysters, and from slow-moving clams. The convoluted, or scalloped edges of the shells radiate for nearly a full circle, but in the region of the beak, where they are joined, two wing-like projections extend laterally, forming an efficient hinge mechanism.

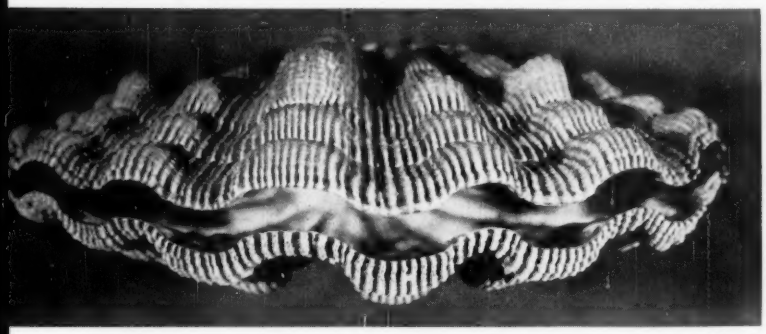
During normal swimming, when the two valves open and close rapidly, twin jets of water are shot out through temporary apertures in the animals' tissue near the hinge. These streams propel the entire scallop forward, the rounded portion foremost and the hinge behind. If watched in clear water, the scallop seems to swim with an irregular skittering motion, often side-slipping to a lower level. At other times when it is startled, the shellfish reverses its direction and goes hinge foremost, while violent shell flappings shoot water from the rounded margin. This form of jet propulsion is powerful enough to move the animal considerable distances at high speed; even for it to break the surface of the water.

Movement in most animals is not possible without muscles, and those of the scallop family are unique. The huge muscle that extends between the valves is divided into two unequal portions. The larger is used for rapid contractions in swimming, while the smaller part is used for holding the shell closed during periods of inactivity. This smaller portion can be considered to be a more primitive form of muscle tissue, and its function consists only of prolonged contraction. The larger part is of a different, more advanced type, and is found most ex-

tensively in insects, crustaceans, and the higher animals with backbones. This portion of the muscle is composed of bunched fibers with microscopic transverse markings, or striations. Striated muscle is capable of stronger and swifter action, but it is more dependent upon the nervous system. Furthermore, the striated muscle in a scallop has two sets of fibers that work against one another to maintain a balance known as "tone." When the muscle as a whole relaxes, the valves open automatically from the pressure of an elastic ligament that is stretched over the hinge.

The internal anatomy of a scallop resembles that of other bivalve molluscs with only a few modifications. The second large muscle found in clams and oysters is missing, but the single muscle we have described is far larger in proportion to the body than any found in other bivalves. The foot, used by clams to dig in sand, is degenerate in this respect, but works to free the scallop's mouth flaps and gills from foreign particles. Large semicircular gills lie within the mantle, enclosing other organ systems. The major pumping chamber of the three-chambered heart surrounds a length of intestine, a situation that would seem peculiar except that it is the rule among bivalves.

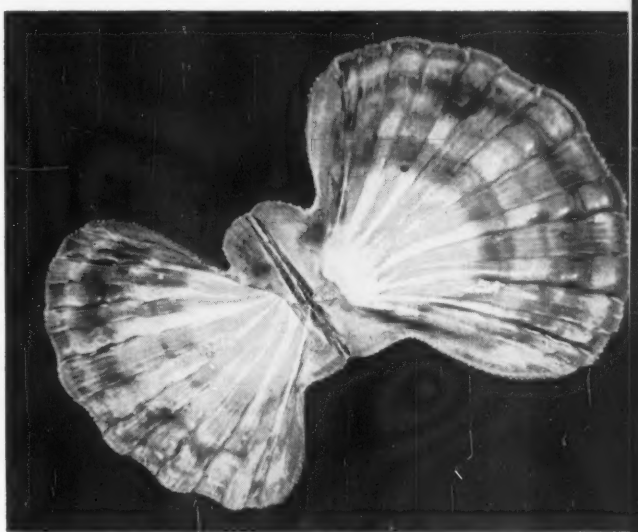
The shell of the large Lion's Paw displays the lines of growth characteristic of scallops. Narrow grooves radiate from the beak at the hinge. The fainter concentric rings that run at right angles to the grooves are indications of growth. Although they are not annual markings as the rings in trees, they correspond somewhat to seasonal and environmental conditions.



The matching valves of a scallop fit perfectly, regardless of how irregular their margins may seem. When the animal withdraws it is protected from all but the strongest and most persistent of enemies. It also can withstand considerable exposure to air by ← keeping moisture within its valves.

A single bay scallop is both male and female, capable of shedding sperm and eggs into the surrounding sea during early summer. After fertilization occurs in the water, young hairy larvae swim about briefly and then descend to the bottom. There they attach themselves by threads to marine vegetation. Scallops grow rapidly, and by winter, perhaps six months after fertilization, they are an inch in length. Within a short time they become free to swim about and thereafter carry on an active life for two or three years.

A scallop specimen may be kept alive in a marine aquarium for short periods, although its planktonic food, composed principally of minute plants and animals, is absent from an artificial habitat. When a scallop rests quietly on the bottom of an aquarium, the valves of its shell agape, there are few more startling sights. Here, in effect, is a clam with dozens of long probing tentacles, and two rows of brilliant eyes, as blue as sapphires. The tentacles move about gently, determining by touch the surrounding environment. If they are stimulated sud-



The hinge of a scallop is exceptionally straight with a long bearing surface. An elastic ligament, situated in the approximate center of the hinge, creates a steady pressure against the valves. As a result, no effort is exerted by the animal in keeping the shells agape while feeding. The single powerful muscle joins the valves toward the outer curves of the white areas. The inner surface of the valves is polished and smoothed by the action of the mantle, which is responsible for depositing shell structure.

denly, the mantle fold, which bears both tentacles and eyes, is withdrawn quickly and the valves clap together in a tight seal. The mantle fold itself is also sensitive, but to chemical substances. A bit of crushed starfish dropped in the tank near a few scallops will cause them to take off in a flurry of alarm, for the starfish is a natural enemy of many bivalves, including scallops. The scallop has a natural chemical tuning that warns it of the approach of this dangerous predator.

It is the eyes of the scallop, however, that most arouse human curiosity. They line the edges of the two mantle folds and are directed outward. There usually are one or two eyes to each scalloped indentation of a valve, but the number often varies. Each eye has a transparent cornea, and a glassy lens surrounded by bright blue pigment. The color does not lie in a contracting iris as it does in our own eyes, but seems to be a shielding pigment to exclude oblique rays of light. Under the lens there is an unusual double-layered retina with upside-down nerve cells. Below the retina is a layer of opaque pigment with a surface of iridescent, reflective fibers. This gives the eyes a luminous brilliance, particularly when light is directed toward them, a phenomenon reminiscent of mammal eyes caught in a headlight's beam. Reflective layers in eyes intensify the stimulation of the retina, for if light is too weak to be perceived when it enters the eye, its strength can be increased by reflection from behind the retina nerve cells.

All eyes in one row are connected to a nerve that runs through the outer edge of the mantle. Each eye registers light intensity, but not images, since the lens serves merely as an efficient light condenser. The animal does not respond unless two or more eyes are affected by a decrease of the existing light, the reason being that a shadow falling across a scallop cannot be considered dangerous unless it moves. In moving, the shadow covers one eye after the next, and the mollusk responds either by closing or by swimming away to an area of fairly equal illumination.

But considering all the unusual features of this remarkable bivalve, the epicure need have no fear of discovering on his plate of broiled scallops a series of beckoning tentacles or watching eyes. All that is eaten of *Aequipecten irradians* is the single, massive muscle!

San Solomon Springs

By NELL MURBARGER

Photograph by the Author.

Balmorhea State Park, centered about famed San Solomon Springs, at Balmorhea, Texas, offers the world's largest walled swimming pool, through which flow 26,000,000 gallons of fresh water daily.

HIDING her treasures where man might least expect to find them is one of Nature's favorite tricks. With Nature and the State of Texas working in partnership, it is not too surprising that the world's largest walled swimming pool should be located at Toyahvale, on the arid plains of the Lone Star State.

Preserved for public use and enjoyment within the 950-acre domain of Balmorhea State Park, in Reeves County, the pool is centered about the famous San Solomon Springs, an American landmark dating from prehistoric times. First used as a watering place by the great herds of buffalo that roamed the west Texas plains, the springs subsequently served the Comanches and other tribes, and later became a point of rendezvous for white traders and trappers, explorers, freighters, and covered wagon emigrants.

Flowing more than 26,000,000 gallons daily, the springs supply the immense pool with constantly changing fresh water, which never varies from 72 degrees temperature, thus making swimming as pleasant in January as in July. After circulating through the pool, the water goes on to irrigate a large tract of farm land.

Situated on U.S. 290, at the extreme southern tip of the Great Plains, the tree-shaded park is known as one of the most beautiful vacation spots in the State.

PHOTOGRAPH BY CHARLES W. SCHWARTZ

A small, dark brown, furry creature was seen frisking on a broad, flat stone at the edge of the brook.

Mink on the Home Grounds

By HOPE SATTERTHWAITE JEX

I THINK of her as "our" mink because she not only graced the brook that crosses our lawn, but for three successive nights she ventured into the ground floor of our house. I assign to her the feminine gender because it is the female of her species that claims a localized area as home, the male being more the vagabond. And I speak of her in the past tense because I very much fear that the mink's body I stumbled upon beneath the deep, unseasonable snow shrouding our lawn last spring was evidence that her trail reached a violent end, probably in the jaws of a neighbor's dog.

We first saw the little mink as we sat at the supper table late in the summer of 1954. Our dining room window gives upon a pool and little waterfall, by which the brook enters our half-acre of lawn. Suddenly our attention was caught by movement at the edge of the brook, just below the waterfall. A small, dark brown, furry creature was frisking on a broad, flat stone. So entered "our" mink into our lives. Although we were less than fifty feet from her, she believed herself to be alone. She scrambled in and out of the water, sat up on the stone and frolicked with abandon. For a number of evenings she played this game at twilight and we watched with delight these antics during the waning of the day.

Although part of the formal grounds about the house, our brook is not without attraction for wild creatures, such as mink and muskrat. The earth is soft and along the upper portion we have set in flat stones to hold the steep banks. There are snug niches among the stones and we have found burrows in the sod about them. Downstream, the banks level off and are edged with grasses and a willow clump. Frogs and young trout find cool retreats within the shade of the grass-hung banks, while in the autumn larger trout come up from the river in their search for spawning grounds. Beyond the lawn stretches a six-acre field of grass and clover, which we leave unmown and which therefore provides a paradise for cottontail, woodchuck, meadow vole and ground-nesting bird. On the west the field is bordered by the river, where the large trout lurk. But, despite the river's allure of deeper pools and winding solitude, one young muskrat chose our brook for his home. And our little musteline neighbor of the evening gambols quite evidently found the brook to her liking.

Although after those initial glimpses we did not see her for a while, the mink continued with us. Her next appearance was startling. One frosty October night she was discovered in, of all places, our living room.

Beyond the lawn stretches a six-acre field of grass and clover, left unmown as a paradise for wildlife.

On the west the field is bordered by the river, which is the place where the large trout lurk.

For a couple of nights my wakeful husband heard scuffling noises in the lower floor of the house. Some Pumpkins, a cat of ours, also heard them and went rushing to investigate. The third night my husband decided to find out their cause. Accompanied by Pumpkins, he settled himself in an easy chair in the living room. Presently the scuffling noises began. He turned on the light and saw a small, furry creature, very dark brown, almost black, with a bushy tail—"our" mink. She seemed completely fearless. Pumpkins went up to her, but did not try to hurt her. Neither did she attack him. She approached my husband, sat in front of him and stared at him. She then retired to the kitchen. My husband feared that the truce between the two animals might not last. So he opened the door leading from the kitchen to the back porch and closed off the kitchen from the rest of the house. In the morning the mink was gone.

How she managed to get into the house, or why she should have wished to do so, we have no idea. She may have entered via the barn or the garage, both of which are attached to the house, from there making her way into the cellar and somehow coming up to the ground floor. In all likelihood it was an involuntary entrance. Once inside, she may not have been able to find her way out, although the latter seems hardly probable, considering the high intelligence of her species. There is the possibility that she was on the trail of a house mouse. All that year we from time to time heard loud, scuffling noises in the walls. But, aside from her single personal appearance, no shred of evidence exists to pin these noises on the mink.

We never saw her again alive. But the snows of the following two winters showed mink tracks about the grounds. If those tracks were made by "our" mink, they showed her to be satisfied with her situation. From the brookside they could be traced over the lawn, coming close to the buildings. Sometimes they followed the brook. Sometimes they struck out across the upper field, with its abundance of meadow voles, or led down to the river, of which the brook is a tributary. But they seemed to keep within a circumscribed area. There were other mink tracks on our land, farther down along the river and in the rugged lower field beyond which stretches the woodland. These tracks, however, seemed to bear no relationship to the brookside tracks.

That is why, providing she was the originator of the tracks, I believe "our" mink to have been a female. The male mink travels miles over a wide cruising range. The female, although she wanders somewhat in her search for food, keeps much closer to home. During the late winter breeding season the polygamous male increases his mileage by seeking out successively the dens of the localized females. Incidentally, he settles down with the last female met upon his rounds. Together they care for the young until the family breaks up towards the end of the summer.

The tragic final chapter in the story of (I unhappily am led to believe) "our" mink occurred last spring, a year and one-half after her appearance in our living room. One April morning I went out to replenish the birds' feeding stations, plowing my way through the heavy snow that had fallen unseasonably upon the Berkshire Hills. I crossed the brook and was heading towards the feeder in the apple tree at the edge of the lawn when my boot struck an object. Pawing down into the snow, I brought to light the small, dead body of a mink.

The lithe form lay twisted, pathetic in the defenselessness of death. As I carried the little body to the upper field to cradle it beneath the snow, I noticed the white chin spot that all minks bear. Whether or not

it was "our" mink—and I believed it was—I felt the tug of sadness. I remembered the brookside games. She had known the full zest of living. Yet, I reflected, she had undoubtedly brought the terminal tragedy to many another creature with an equal zest for life.

The mink's nemesis, I feel fairly certain, was a canine neighbor who spends a large part of her waking life on the hunting trail. A few days earlier I had met this dog carrying, first a dead mouse, and a little later, a dead star-nosed mole. And I had noticed that she bore a deep wound, blood-encrusted, above one eye and other wounds upon her lower jaw, wounds that neither mouse nor mole could possibly have inflicted. A cornered mink fights fiercely.

I love dogs dearly. I have been privileged to share my home with many a loyal canine friend. But I cannot help wishing that some other form of amusement could be offered the country dog in place of unsupervised hunting. When two or three dogs join forces to run deer there are usually complaints from biped hunters. I myself, last autumn, found in our lower field the leg of a white-tail, stripped of flesh except for a bit above the hoof, to which the tawny summer coat still clung. Dogs undoubtedly had carried it there. Yet from personal experience I know that, given understanding guidance, neither dog nor cat need become an inveterate hunter.

The little waterfall by which the brook enters the half-acre of lawn.

In the case of the mink, this instance of unnecessary killing was particularly unfortunate. The mink has a hard enough time in the Commonwealth of Massachusetts without the risk of death from the jaws of roving dogs. Only last year, under pressure from the over-articulate sportsmen, the trapping season for furbearers, including the mink, was lengthened by a month, and this despite the fact that the Division of Fisheries and Game reported the State's furbearing population as hardly able to stand such an increase.

Regardless of the State's open season, however, the creatures on our land are safe from trap and gun. Our property is posted—posted for the sake of the creatures themselves, not, as is sometimes done, to create a private hunting preserve. Small though it may be, its thirteen acres offer sanctuary, and such small havens do their bit for wildlife Perhaps next winter there will again be mink tracks in the snow along the brookside.

FAREWELL

Heron and hummingbird, big bird and small,
Take to the airways always in fall
And we say Godspeed to them all.
Godspeed to the winged and the unwinged also,
The deer in the forest ahead of the snow
And the fieldmouse under the meadow.
Godspeed to the travelers who take to the air
And the sleepers, porcupine, woodchuck, and bear,
And the wakers, bluejay and hare.
Alone in the twilight of autumn we stand
And the wings of the heron high over the land
Wave goodbye like a handkerchiefed hand.

Elizabeth Jane Astley

Mice Dwellers of the Tree Tops

By RUBY EL HULT

A rare photograph of a red tree mouse among the needles of the fir tree in which it is uniquely at home.

U. S. FISH AND WILDLIFE SERVICE PHOTOGRAPH

To be more precise in our speech we might well change the expression "shy as a deer" to "shy as a tree mouse." For these rare little dwellers of the high evergreen tops never show themselves to man voluntarily. They have become known only to a few people who have raided their arboreal homes in the name of science.

Few travelers in the dense coastal forests of Oregon and northern California, where the only two known species of tree mice dwell, are aware of their presence. Generation after generation they remain undisturbed, unless their principal foe, the logger, comes with axe and saw to destroy their habitat.

The red tree mouse, *Phenacomys longicaudus*, is a little larger than the ordinary house mouse. Its fur is rusty, or cinnamon-red, with white underparts, and a long hairy tail.

For a home it prefers a tall, wind-swayed Douglas fir, but as second choice will accept a grand fir or spruce. The height selected for the nest may be from fifteen to one hundred feet above the ground—anywhere that branch formation gives a secure base and a supply of live foliage. The usual nest is a fairly compact round ball a foot or more in diameter, put together of dry twigs and lined with shredded fir leaves. Larger nests may have been started on old hawk or squirrel nests, and doubtless are built up during long years of living. Some that have been found have encompassed the whole tree trunk and contained as many as five nest cavities, these connected by a complicated tunnel system.

It seems the usual practice for males and females to occupy different nests. They breed in spring and summer, and occasionally even later in the season. The litters are small, two or three babies being average.

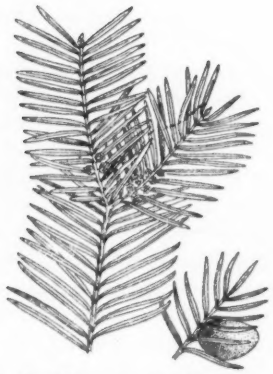
For food the mouse finds its pastures in the branches, eating the soft pulp of conifer needles and the inner bark of twig tips. This gives it enough moisture so it seems not to have to seek water. As trees in the humid forests of its habitat press close together, each mouse probably ranges through several trees in the vicinity of the nest site. When it nips off a twig, sometimes it eats its meal on the spot, at other times it carries the greenery to the nest. In eating it holds the twig using its forefeet like hands.

The red tree mouse was first discovered in 1890 by Aurelius Todd of Eugene, Oregon, while hunting birds' nests on a tributary to the South Umpqua River in Douglas County. For two decades thereafter it was considered one of the rarest and least known mammals in the world. Then in 1913 and 1914 a number of nests were found in Mendocino County, California, and a dozen or two specimens given intense scientific study.

The dusky tree mouse, *P. silvicolus*, is an even more elusive creature. Named as a new species in 1921, it differs from the red tree mouse by being smaller, darker in color, and having a longer, narrower skull. At that time only one specimen had been found, and to this day not more than a dozen adults and young have been taken. Where the Oregon Coast Range merges with the Willamette Valley, a nest with a mother and four babies was discovered in a broken Douglas fir, forty-five feet above the ground. In two instances in Tillamook County, loggers captured one of the little rodents after felling their nesting tree. In the Netarts Bay area Alex Walker of Tillamook located several nests, capturing two females and two babies. (*continued on page 500*)

More Cone-Bearers

By E. LAURENCE PALMER



1. California Nutmeg

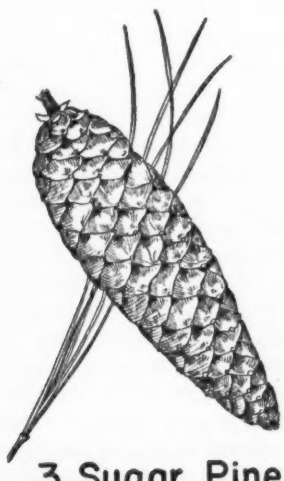
This is the eighty-eighth in NATURE MAGAZINE'S *series of educational inserts.*

EVANGELINE'S "murmuring pines and the hemlocks" were given some consideration in the twenty-seventh unit of this series, published thirteen years ago. It is appropriate that, at another approaching Yuletide, we get acquainted with the group of trees that plays so important a part in our economy, religion, literature, recreation, history, education and folk lore. None of the species here considered was dealt with in the earlier insert.

Let us look at our cone-bearers first from their role in our industry and national and personal economy. It strikes home to most of us when we have occasion to use some of these wood products in any way. For example, twenty-four years ago I built my home, just fifteen years after I had been discharged from military service with a bonus of thirty dollars. During those fifteen years I began my career as a college professor and saved enough to buy two houses, in one of which I invested $7000. The new house of twelve rooms and three baths cost me $11,000, all of which I paid up the day I moved in. The new house had hardwood floors throughout, was basically hard yellow pine, with cedar shingles for a roof and tapestry brick veneer over rockwool and insulated lath. I seriously question if many college professors today, in our much touted new prosperity, could in fifteen years save enough to build the equal of my newer house, let alone pay for a second house. I am sure that I could not do it today with twice the income I then had.

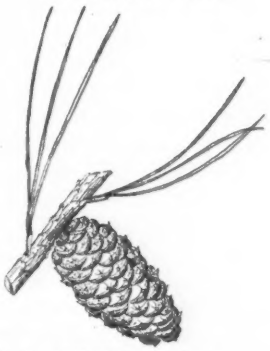
I mention the above not in pride over any personal economy, or to express my judgment of the merit of the planned economy that has prevailed in the last third of a century. The latter has unquestionably influenced the situation, but the crisis associated with the production of woody plant building materials is also important. The supply of yellow pine when I built my house was not the same as it is today, and building today one is now denied the privileges I enjoyed. Yellow pine, of course, is one of the subjects of this particular insert, and all pines—all cone-bearers for that matter—are of vital importance to readers of this or of any other magazine. In fact, the very existence of any magazine is determined to a large extent by the availability of wood pulp used in

2. European Yew



3. Sugar Pine

4. Yellow Pine



5. Loblolly Pine

6. Monterey Pine

7. Jack Pine

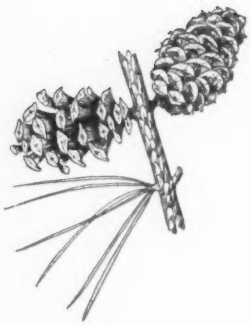
making the essential paper for printing.

Of twenty major industries affecting the economies of the average citizen, few employ more citizens than the lumber, pulp and allied industries dependent on woody plants. It is safe to assume that a fair share of this employment was dependent on cone-bearing trees. Of these twenty industries only eight represent greater earnings by those actually engaged in production than goes to workers employed in the industries directly dependent on wood. These facts are confined to those engaged in producing, harvesting and processing woody plant materials. If we include in our woody plant industries those identified with furniture manufacture, only two major industries have greater importance.

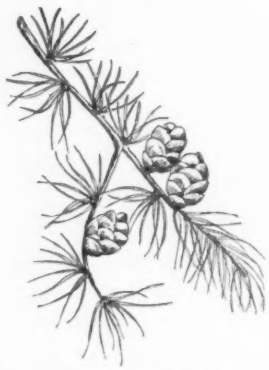
In 1952, one and a half million persons in the United States earned more than five billion dollars producing lumber, pulp and furniture. An equal number, engaged in transportation, earned about seven billion dollars, and a million individuals identified with electrical machines earned about three and one-half billion dollars.

Obviously our woody plants provide a substantial amount of materials on which the economy of a generous proportion of our population depends. From 1945 to 1952 the per-man-hour earnings of those identified with the production and processing of paper pulp increased approximately 40 percent. The increase in that time for those engaged in the production of rayon and synthetic fibers was three times that found in the pulp industry.

A cross-section of the industries identified with woods calls attention to industries producing newsprint, wood pulp, pressed woods, plastics, paper board, cooperage, lath, lumber and shingles, and to the turpentine and rosin industries. Surely these affect profoundly everyone who reads these words. The basic plants that supply these materials, then, should be better understood by all.



8. Shortleaved Pine



9. Tamarack

10. Black Spruce

11. White Spruce

Since we deal here primarily with cone-bearers, important among which are the pines, let us get a quick view of how some of these vary. In 1952, the lumber industry in the United States produced 8495 million board feet of yellow pine lumber. In the same year 3706 million board feet of ponderosa pine lumber were produced. White fir to a total of 1285 million board feet, and 400 million board feet of sugar pine lumber entered the trade the same year.

Wood still is an important fuel in many parts of the country. Southern yellow pine has a fuel value equal to red oak, sugar maple, yellow birch, beech and ash. It is less valuable as a source of heat than hickory or white oak, but a greater fuel value than that of white pine, Douglas spruce or elm.

Five of the States of the Union have their popular name identified with woody plants, and of these two refer primarily to cone-bearers. Maine is the Pine-tree State; Washington, the Evergreen State. The Buckeye State is Ohio; the Magnolia State, Mississippi; the Sage Brush State, Nevada. Of course, many States have State trees, a considerable number of which are conifers. The State tree of California, of course, would be the redwood, and of Oregon the Douglas spruce. It was largely from Maine that England's king got the pine masts that helped make the country's navy seem invincible. It is appropriate, then, that the white pine should be Maine's State tree. Minnesota, also famous for its white pine, has the same State tree as Maine, and Idaho has as its arboreal emblem the western white pine, which they call the Idaho white pine.

Alabama 's official tree is the slash pine, and Georgia has the longleaf pine. Montana has the ponderosa pine and Wyoming the lodgepole pine. New Mexico and Nevada have, as their State trees, the pinyon pine, although the species are a bit different. Pennsylvania's State tree is the hemlock, and Tennessee's the eastern red cedar. New Jersey has the white cedar for its emblem and Utah and Colorado agree on the blue spruce for a State tree.

It is a bit surprising that so many State trees should be cone-bearers, and it must be taken as evidence that these trees are well known and popular where they are so recognized. In a number of cases the trees have been selected by some sort of popular vote. The children of Wisconsin, for example, chose for their State the sugar maple. Within the past year the governors of New York and of Vermont got into quite an argument about the relative merit of maple syrup from these two States, but both have that species as their State tree. The only State in the Union that

apparently elected a tree not native to this country was Michigan, which chose the apple.

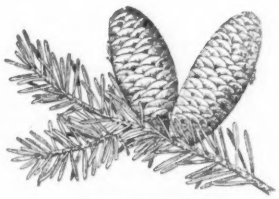
An examination of the chart section of this insert will show that some of our cone-bearers produce substances of medicinal value. Spruce gum, turpentine and a few others might be mentioned.

Some minor uses of coniferous products may be worthy of mention. For example, when a tree is sawed into lumber as much as 10 percent of the log may be turned into sawdust. Of course, the nature of the sawdust will be determined, in part at least, by the nature of the wood from which it came. One of the important but specialized uses of sawdust is for packing fruits, such as fancy grapes, for shipping and for a degree of preservation. We cannot use for this purpose sawdust that would flavor the grapes. White fir sawdust, which is tasteless, is much more valuable for grape-packing than is pitch pine sawdust. In one year 4000 tons of white fir sawdust are used for packing grapes. An interesting folder on the unique uses of sawdust may be had from the United States Forest Service in Washington.

In our consideration of the cone-bearers let us shift now from the ultra practical to the opposite side, the academic angle. I am reasonably sure that one of my better college friends will jump on me for a few words in this article. He has done it before, but he has not had the reaction I have had from some who have read what I have written over a period of years.

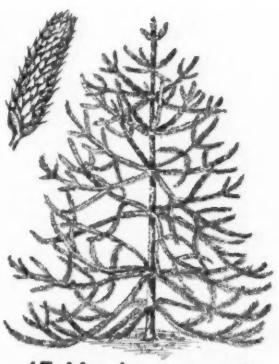
In the chart section I wrote of the cones as though they were staminate and pistillate. Technically I am not correct, because what I have called pistillate cones do not produce pistils. If they did the scales of the cones would be joined by their edges instead of being free as they are. Actually I should have referred to them as ovulate cones, but I did not wish to introduce that relatively new word to my readers, and since the cones in a way correspond to what are pistils in the higher plants I thought it better to use the related term. My professional critic, who would prefer I use ovulate to pistillate, has, in my judgment, little cause for making his criticism because regularly he calls the cones male or female. In this he is farther from the truth than I am, because they are neither. They are, of course, a part of the spore-producing cycle, sporophyte phase of the plants' life cycle, while the term male and female should be applied to the gamete or sex-cell producing cycle, gametophyte stage. Both my critic and I are wrong, and we both will argue endlessly in justification of what we have done and in criticism of the other. That, it would seem, is one of the prerogatives of the professional educator. The cone-bearers then have a use by providing a basis for academic argument as well as for lumber, employment and finance.

12. Engelmann Spruce



13. White Fir

14. Big Tree



15. Monkey-puzzle Tree

Just to prove how illogical an argument based on logic may be, let me point out that one of my pet peeves is based on a statement relatively frequent in literature for elementary school use. It is prominent in one series of readers of most general use and prepared by persons of the highest rank in professional science education. This statement is to the effect that it is because the sap in evergreen leaves does not freeze that these leaves remain green all winter. It might be worth checking.

Woody plants and, notably, cone-bearers have found a place in other fields than those so far mentioned. Enos Mills, in his *Story of a Thousand Year Pine*, blended technical information with romantic Nature and literary ability to make a literary gem that is useful. Somehow it has not found the general recognition in Nature literature that I think it deserves. Others have written with spectacular ability about the role ancient trees have played in helping us interpret the climate and weather or the past by reading the growth rings in the trunks of these trees. In fact, this technique has provided a useful tool in linking evidences of ancient culture for which we do not have continuous chronological dependable data. It may be incidental to the subject of this insert, but most of this story uses the wood of cone-bearing trees as a source of information. It is also interesting that probably both of the groups claiming representatives of the oldest living things on earth are members of this group. Both are considered in our chart section.

Sometimes one wonders what would happen to self-styled writers of popular verse and fiction if we did not have pine trees. I am sure that (*continued on page 480*)

COMMON NAME SCIENTIFIC NAME	CALIFORNIA NUTMEG *Torreya californica*	EUROPEAN YEW *Taxus baccata*	SUGAR PINE *Pinus lambertiana*	YELLOW PINE. BULL PINE *Pinus ponderosa*
DESCRIPTION	Height to 100 feet with a trunk diameter of to 4 feet, but usually smaller than either of these measurements. Branches spreading and drooping slightly. Bark to ½-inch thick, of an orange tinge on 2-year old branches, irregularly divided into narrow ridges topped by loose scales. Leaves to 3 inches long, shining dark green.	Height to 60 feet and a trunk diameter of to 8 feet. On old trees the bark is deeply furrowed. In young trees the bark is reddish, flaky and smooth. Branches droop gracefully. Leaves are persistent, to 1¼-inch long, dark shining green above and paler yellow-green with lighter lines beneath.	Our largest pine. Height to 220 feet, with trunk to 12 feet in diameter and flat-topped crown to 70 feet across. Bark to 3 inches thick, divided into ridges that are scale-covered, irregularly divided, long and thick. Needles in 5s with conspicuous white lines on back, to 3 inches long. Persistent to 3 years.	Height to 225 feet. Trunk diameter to 8 feet. Branches short, thick, forked sometimes drooping but turning up at ends. Bark lasts to 100 years, broken into rounded ridges, with close scales varying in color with age and sometimes in plates to 5 feet long and 1½ feet wide. Needles in 2s or 3s, 11 inches long, last 3 years.
RANGE AND RELATIONSHIP	Order Coniferales. Family Taxaceae. A California species, and even there is nowhere common. In Tulare County it is found at elevations of 3000 to 5000 feet. There are 4 related species in North America and in Asia, with the Japanese being hardiest of all. It is grown in New England as an ornamental.	Order Coniferae. Family Taxaceae. Native of Europe and North Africa east to the Himalayas. Grown as an ornamental over wide areas of the world where conditions are suitable. In America this species is hardy north into New England and western New York. In the far West is found the native *T. brevifolia*.	Order Coniferales. Family Pinaceae. Mountain slopes from Oregon to Lower California, usually at 5000- to 7000-foot elevation. Best on well-drained soil, in the sun. Distribution not continuous through range. Has been planted as an ornamental in the East and in Europe, but does not there equal the grandeur it attains in its natural setting, where it grows more rapidly.	Order Coniferales. Family Pinaceae. Nebraska to southern British Columbia and south to Lower California and northern Mexico. There is a variety, *jeffreyi*, in great forests of northern California, and a variety, *arizonica*, of Arizona and adjacent Mexico. Both known as yellow pine and with minor differences. Often in pure stands.
REPRODUCTION	Flowers appear in March, or later, the staminate having broad but acute scales and the pistillate being to ¼-inch long. The developing fruit becomes light green, streaked with brown, and is to 1½ inches long, appearing cherry-like but having thin flesh. May be propagated by seeds or by cuttings, or by grafting related forms.	Fruit a berry-like structure surrounding a broadly egg-shaped seed that is about ¼-inch long. Plants bear either staminate flowers, or those which bear the fruits. The flowers appear in early summer or spring, and the fruits mature in the autumn of the same year. If not eaten by birds they may persist.	Staminate cones yellow; pistillate, green, appear in spring on same tree. Cones ripen in August of second year and seeds are shed in October and thereafter. Cones are to 21 inches long and bear seeds that are about ½-inch long, chestnut to black and about ½ length of blunt ½-inch wide wing, which is firm.	Cones ripen in August of 2nd year after flowering and begin shedding seeds in September. 12,000 seeds per pound, with 1 bushel of cones yielding 9-32 oz. Staminate cones yellow; pistillate, dark red, in clusters or pairs. Cones to 6 inches long, clustered, light red-brown, shed early. Seeds to ¼-inch long, dark purple.
ECOLOGY	Wood is soft, light yellow, with white sapwood, close grained and light weight. It is hard and strong except when in contact with the soil, stands temperature and wetting well and is a good general-purpose wood. It takes a reasonable polish when used in ornaments and is generally popular for such use.	Wood is hard, strong, durable, resistant to weather and makes an excellent, long-lasting fire. Because of its superior fuel qualities it has given us the Yuletide, when Yule, or yew, logs were burned in fireplaces particularly in England and the Old World. The related Canada yew, or ground hemlock, of the East is well known.	One bushel of cones may produce 25-32 oz. of seeds weighing 2100 to the pound, with 65% germination. Heartwood ages to deep reddish-brown. Wood weight, green 52 pounds per cubic foot; dried, 25 pounds. 1000 board feet weighs 3000 pounds. Wood light, soft, straight-grained, uniform. Works well. Holds paint well.	Wood with specific gravity of .38. 1 cubic foot green wood weighs 45 pounds; dried, 28 pounds. 1000 board feet weighs 2330 pounds. High workability, good with glue and for staying in place; fair for paint holding and poor for holding nails. Takes about 4 hours for 1 man to mill 1000 board feet.
ECONOMY	Uses of American species have been suggested. The greatest popularity lies in the beauty of the trees, largely because of the brilliant foliage and the artistic shape of both young and old plants. A Florida related species is known as stinking cedar from the odor of the crushed leaves.	In America the European yew is used more commonly as an ornamental than as fuel, and it is coming to be replaced in the ornamental group by Asiatic species. Of course, in the West where there are native yews that are trees the story may be different, but easterners have difficulty in reconciling ground hemlock with trees.	An important soft wood in the veneer industry and used for lumber, but poor where nailing is necessary. Tree attacked by mountain pine beetle. Serves as food for porcupines, chipmunks, squirrels, gray fox and, to a minor degree, mule deer.	State tree of Montana. Important in softwood veneer industry. Good for erosion control. Birds and squirrels feed on seeds. Wood used as fuel, as lumber, in box making and for trim. Tree is attacked by western pine beetle, mountain pine beetle, Black Hills beetle and paintbrush blister rust.

LOBLOLLY PINE *Pinus taeda*	MONTEREY PINE *Pinus radiata*	JACK PINE *Pinus banksiana*	SHORTLEAVED PINE *Pinus echinata*	TAMARACK. AMERICAN LARCH *Larix laricina*
Height to about 100 feet, with straight trunk reaching a diameter of to 5 feet. Branches spreading, profusely separated. Twigs brown tinged with yellow and nearly smooth. Bark to 1½ inches thick, bright reddish-brown, with shallow cracks dividing broad flat ridges. Leaves, slender, twisted, pale green in 3s, to 9 inches long.	Height to 115 feet in America, but betters this in New Zealand, where it grows more vigorously and rapidly. Trunk to 4½ feet in diameter with 2-inch bark that is dark brown, deeply divided into broad, flat-topped ridges. Needles in 2s or more commonly 3s, slender, bright green, to 4 inches long and persisting 3 years.	Height to 70 feet, with straight trunk rarely more than 2 feet through, commonly unbranched to 30 feet. Bark thin, brown, tinged with red, with thin close scales at surface and narrow connected rounded ridges. Needles in 2s, in separated clusters, shedding 2nd or 3rd year, yellow-green to dark green, to 1¼ inches long.	Height to 120 feet, with tapering trunk and trunk diameter to 4 feet. Branches usually slender with brittle pale green branchlets whose bloom rubs off. Bark to 1 inch thick, in large irregular plates, with light red scales at surface. Needles in 2s or 3s, slender, dark bluish-green, to 5 inches long and shed between 2 and 5 years.	Height to 60 feet, with trunk to 20 inches in diameter and branche definitely horizontal and arising from central straight trunk, sometimes twisted. Young branches may bear a downy covering. Bark to ¾-inch thick, breaking into reddish-brown scales. Needles triangular in cross section, bright green, to 1¼ inches long, shed 1st year.
Order Coniferales. Family Pinaceae. From New Jersey to eastern Florida to eastern Texas, Oklahoma, Arkansas and in Alabama to elevation of 1500 feet. Often grows in pure stands on soils that have been ruined by agriculture, or are too dry for competition from other species. In too wet soils develops little leaf disease.	Order Coniferales. Family Pinaceae. Native of a narrow belt in California and Lower California, but cultivated for ornament and for windbreak rather widely in United States, Mexico, Europe, Australia and New Zealand where climate is mild. It naturally grows farther south than other pines, but in New Zealand may be at its best.	Order Coniferales. Family Pinaceae. Nova Scotia to northern New York, west to Minnesota and the Athabasca and Mackenzie River valleys. At its best in dry, sandy soil and most abundant in Michigan-Saskatchewan area. May form pure stands or be mixed with other species around edge of range.	Order Coniferales. Family Pinaceae. Ranges New York to northern Florida and west through Gulf States to eastern Texas, Oklahoma, Missouri, Illinois and Tennessee. At its best west of the Mississippi River, where its size and abundance is greatest. It grows well on poor clay and sandy soils in pure stands or with hardwoods.	Order Coniferales. Family Pinaceae. Ranges from dry upland to low swamps, from Labrador to the Rocky Mountains at latitude 65° 35′ N. to Arctic Sea and south to western border of Canada and in east to West Virginia. Is often planted as a quick-growing ornamental, but its needles create an undesirable clutter in many places.
Staminate cones, yellow, crowded, appear in March. Pistillate yellow, solitary or clustered. Mature in fall and open gradually, shedding seeds through winter with cones persisting 1 year. Cones to 6 inches long, light reddish-brown with short, stout, backward-spreading prickles. Seeds to ¼-inch long, rough, dark brown blotched.	Cones mature in August from clustered, purple pistillate flowers. Staminate cones yellow. Mature cones to 7 inches long, maturing 2nd year, remain persistently closed 6 to 10 years and are opened by heat. Seeds to ¼-inch long, nearly black with light brown wings to nearly 1 inch long and with longitudinal stripes.	Staminate cones yellow, in crowded clusters. Pistillate dark purple at first, when mature to 2 inches long, incurved, green to lustrous yellow, with fine prickles that may be shed. Mature second September and persist to 25 years, shedding seeds over first years. Seeds triangular to 1/12-inch long. Chromosomes, 24.	Staminate cones light purple, in crowded clusters. Pistillate, rose color, in 2s or 3s. Cones mature 2nd September and persist over 2 years, to 2½ inches long with chestnut-brown scales, horizontal or pendant, with scale tips slightly thickened and with prickles that are shed, usually. Chromosomes number, 24.	Staminate cones like small spheres borne close to twigs. Pistillate, greenish and reddish When mature cones are to ¾-inch long as contrasted with to 1½ inche in European larch. Cones have about 20 scales and are shed 2nd year. Best age for seed production, 40-75 years with best seed crops every 5 to 6 years.
One bushel of cones yields to 24 ounces of seeds weighing 55,000 to the pound with germination of 25-80%. Wood with specific gravity of .47, with 1 cubic foot weighing 53 pounds green or 36 pounds dry, and 1000 board feet weighing 3000 pounds. Tree is attacked by fusiform rust causing swelling of stem; by southern pine beetle.	Plant does not live long in too dry soil and does poorly in wet soil. Is tolerant of shade and of saltiness; builds humus on ground rapidly; in some areas grows with spectacular rapidity and vigor. Maturity is reached at from 80 to 100 years and few live beyond 150 years, making it a short-lived pine.	Seeds, 131,000 to the pound, with 1 bushel of cones yielding to 11 ounces of seed, with average germination of 50%. Wood, light, weak, pale brown to orange with white sapwood, close grained with good workability and paint-holding qualities. Kiln-dries excellently and glues well, but rots rapidly in contact with soil.	40,000 to 80,000 seeds per pound, with bushel of cones yielding about 5 ounces and with germination 30-90%. Wood with specific gravity of .46, 1 cubic foot weighing 52 pounds when green or 25 pound cured. 1000 board feet weighs 3000 pounds. Attacked by pitch canker, gall rusts, southern pine beetle and little-leaf disease.	One bushel of cone yields about 9 ounces of seeds, which weigh 90,000 to the pound and may remain viable from 3 to 6 years. Wood, heavy, strong, hard, durable in contact with soil, brown with white sapwood, which is thin. Wood of western larch weighs 3000 per 1000 board feet.
Important source of telephone poles, of pulp and of lumber. Recognized as valuable in soil erosion control and as source of food and shelter for wildlife. Bobwhite known to feed on the seeds. Wood is not durable and is used as lumber for interior finishing where it will remain dry. Half of trunk may be white sapwood.	Commonly used for windbreaks but also produces usable rough lumber. Probably has one of the widest distributions of California's trees because of its suitability in landscaping. The variety *binnata* from Guadaloupe Island off Lower California has most of its leaves in bundles of two.	Used for mine timbers, for coarse lumber and for paper pulp, but not for poles or fence posts, one of most important sources of pulp for *mechanical* pulp and used in sulfate process pulpmaking. Most important source of commercial Christmas trees. Porcupines known to feed on the tree.	A good source of shingles. Important source of telephone poles, of pulp, lumber and railroad ties. Average life of a tie 5.3 years. Considered important as soil anchor and in some cases as food and shelter for wildlife. Pine siskins and crossbills known to feed on the seeds.	Used in heavy construction, as poles and posts and ties, as fuel and for general purposes. Wood holds nails poorly, has good workability, does not paint well but glues well. Squirrels and deer feed on the young trees or cones. Inner bark has medicinal value. Tree grown in landscaping and may be attractive at a distance.

COMMON NAME SCIENTIFIC NAME	BLACK SPRUCE *Picea mariana*	WHITE SPRUCE *Picea glauca*	ENGELMANN SPRUCE *Picea engelmannii*	WHITE FIR *Abies grandis*
DESCRIPTION	Height to 100 feet with a trunk diameter of to 3 feet but usually smaller in both measurements. Branches short, upcurving, with hanging branchlets, which are pale green and lighter when young, may be covered with rusty fuzz 1st year but smooth 2nd year. Bark to ½-inch thick, gray brown. Needles to ¾-inch long.	Height to 150 feet with a trunk diameter of to 4 feet, but commonly smaller in both measurements. Branches long and relatively thick in graceful upward curves. Twigs not hairy, orange-brown first winter changing to gray-brown. Leaves mostly on upper side of branches, to ¾-inch long, dark green to pale blue, 4-sided.	Height to 120 feet, with trunk to 3 feet through and branches that appear in regular whorls to form a compact pyramidal head. Bark ½-inch thick, cinnamon-red, with large, thin, loose scales. Leaves slender, flexible, with unpleasant odor, sharp-tipped, to 1-1/8 inches long, at first with a whitish bloom but later dark blue-green.	Height to 300 or more feet with slightly tapered trunk that may be 4 feet through. Branches curve nicely or hang downward in parts. Twigs fuzzy first year and pale yellow-green, but smooth and orange-brown the second. Needles to 2½ inches long, thin, easily bent, dark green above and shining but silvery white beneath.
RANGE AND RELATIONSHIP	Order Coniferales. Family Pinaceae. Found in cold bogs and swamps but rarely on dry ground. Ranges from Labrador to Alaska and south to Minnesota, Saskatchewan and Virginia. More abundant north of Canadian border than south. At its best in northern Manitoba and Saskatchewan, where it is the area's largest tree.	Order Coniferales. Family Pinaceae. From Newfoundland along tree border to west coast of Alaska and south to Maine, Michigan, Minnesota, Wyoming and Montana. Grown outside this range for ornamental and for other purposes. Largest forms are variety *albertiana*, found in southwestern part of range given above.	Order Coniferales. Family Pinaceae. Ranges from Alaska to northern California, Colorado, New Mexico and Arizona. At 1000 to 6000 feet elevation in Canada; at 4000 to 6000 in Washington; at 8500 to 11,000 in Arizona and at 8500 to 12,000 in Colorado. Grown as ornamental in New England and in Europe.	Order Coniferales. Family Pinaceae. Ranges from British Columbia to northern California east to Montana. It is Oregon's only sea-level fir and in that State does not get to above 3000 foot elevation. In California it is only a few miles from the sea and rarely above 1500 foot elevation. Known commonly as stinking fir.
REPRODUCTION	Staminate cones show dark red anthers. Pistillate are purplish at first. Mature cones to 1½ inches long, with rigid rounded scales ripening first September and shedding seeds for many years after 1st October. Good seed crops every 4-5 years but tree may shed seeds from 30 to 250 years of age. Chromosome number, 24.	Staminate cones, pale red, appear in May but changing to yellow with pollen. Pistillate, with red or green scales. Mature cone, cylindrical, green to 2 inches long, maturing by mid summer and shedding seeds by October. Good seed crop every 2-6 years. Scales of mature cone, thin and flexible. Chromosome number, 24.	Staminate cones, dark purple. Pistillate flowers, bright red. Flowers June-July. Matures cones August-September. Frees seeds August-September. Good seed crop every 2-3 years when tree is 16-200 years old. Mature cones cylindrical, narrowed at both ends, short-stalked, about 2 inches long and usually shed first winter with seeds.	Staminate cones pale yellow to purple. Pistillate light yellow-green. Mature cones erect, cylindrical, bright green, to 4 inches long with scales about 2/3 as long as wide and shed on tree. Seeds to nearly ½-inch long, light brown, with pale wings, to over ½-inch long and nearly as wide. Rounded at tip. Shed in October.
ECOLOGY	One bushel of cones yields to 5 ounces of seeds, weigh 404,000 to 540,000 per pound. Trees may sprout freely from the roots. Wood, weak, soft, pale yellowish-white, with thin sapwood, weighing 34 pounds per cubic foot when green or 28 pounds when dried. 1000 board feet of lumber weighs about 3300 pounds.	One bushel of cones may yield to 20 ounces of seeds weighing 240,000 to the pound with a germination of about 50%. Wood is excellent for holding glue, good for workability and staying in place, fair for holding paint and nails and poor for resisting decay, light, soft-grained, light yellow, 34 pounds per cubic foot green.	One bushel of cones may yield 1 pound of seeds weighing 135,000 to the pound. Specific gravity of wood .31. One cubic foot of green wood weighs 39 pounds, of dry, 23 pounds. 1000 board feet weighs 1920 pounds. Wood holds nails poorly, has little decay resistance, glues well, works well and stays in place well.	There are 20,000 to 34,000 seeds per pound, with a 50% germination. Wood is usually knotty, decays easily and has bad odor, is light brown, coarse-grained, with thin, lighter sapwood. It holds poorly, works easily, is easily glued and worked. It does not hold nails well. The largest American fir tree.
ECONOMY	Twigs used in making a beverage. Spruce gum used medicinally. Wood used chiefly as pulp but rarely sawed into lumber in Northeast because of small size. Used in chemical pulp manufacture, as an ornamental and popular as a Christmas tree and grown for this purpose in some areas.	Wood is used for the most part in making paper pulp, for which the tree is one of the principal sources. It is also used for interior trim and construction, but not where exposed to weather. Trees used as Christmas trees and plants are fed upon by deer, mountain sheep, moose, porcupines, squirrels and some birds.	Wood is used in making charcoal, for fuel, as lumber and the bark has been used sometimes in the tanning of leather. In some places it is grown as an ornamental, but it may be injured by late spring frosts. The tree is attacked by the Engelmann spruce beetle and by other enemies.	A popular Christmas tree species. It is used sparingly as lumber for woodenware, interior finish and packing boxes. The sawdust, interestingly enough, is tasteless and 4000 tons of this sawdust are used yearly by grape growers for packing fruit for safe shipping. Is planted in gardens in Europe as an ornamental.

BIG TREE *Sequoia gigantea*	MONKEY-PUZZLE TREE *Araucaria imbricata*	BALD CYPRESS *Taxodium distichum*	INCENSE CEDAR *Libocedrus decurrens*	ALASKAN CEDAR *Chamaecyparis nootkatensis*
Height to 320 feet with trunk diameter of to more than 38 feet, usually much enlarged at base and in age often without branches below 150 up. Bark to 2 feet thick, lobed in units to 5 feet wide, cinnamon-red, highly fire-resistant. Leaves to ½-inch long, sharp-pointed, spreading or pressed to twigs, ridged.	Height to 100 feet, with stout branches in whorls of 5 that spread or have upturned ends. Branches may become downward tending when, with age, they have become several feet long. Branches and trunk are covered with stiff, sharp-pointed leaves that are from 1 to 2 inches long and closely crowded.	Height to 150 feet, with trunk to 12 feet through and base with widely flaring buttresses. Usually hollow when old. Bark to 1 inch thick, bright red, with irregular scale-covered ridges. Leaves to ¾-inch long, flat, thin, narrow, bright green, borne like parts of feather on branchlets, which, like leaves, may be shed each year.	Height to 200 feet, with irregularly lobed trunk that may have a diameter of to 7 feet. Bark 1 inch thick, crimson-red, irregularly broken into ridges of closely pressed scales. Leaves pressed close to branchlets, bright green, particularly conspicuous on young trees because of color.	Height to 120 feet, with trunk to 6 feet in diameter. Branches horizontal, forming narrow pyramidal head. Bark to ¾-inch thick, brown-tinged gray, with thin loose scales. Branchlets at first red-brown becoming brighter about 3rd season and then becoming pale. Leaves about ¼-inch long, closely pressed to branchlet.
Order Coniferales. Family Pinaceae. Found generally in central California on west side of the Sierra at elevations between 5000 and 8500 feet. In some areas in pure stands, but these are being greatly reduced. Probably best developed on north fork of the Tule River. Grown as an ornamental in Europe and elsewhere.	Order Coniferae. Family Pinaceae. Related to the Norfolk Island pine that is a common house plant and used to be in many hotel lobbies. The monkey-puzzle tree is native of Chile, but is grown in widely separated parts of the world, doing well in Ireland and England and along Pacific Coast of the United States.	Order Coniferales. Family Pinaceae. Found largely from Delaware to Florida and west to Texas and Missouri, usually in swamps where water is strong with lime but sometimes on high dry ground. In Texas to elevations of 1750 feet, but usually 90% is found below 100-foot elevation. Related Montezuma cypress of Mexico may have trunk diameter of 20 feet.	Order Coniferales. Family Pinaceae. Ranges from Lower California to Nevada and Oregon. Related species, 8, extend range to South America, China and Australia. The cones of the closely related genus *Thuja* have more numerous scales, with 2 pairs bearing seeds. In *Libocedrus* there are 6, in *Thuja* 8-12 cone scales.	Order Coniferales. Family Pinaceae. Ranges from Prince William Sound in Alaska to Siskiyous of southern Oregon, being found in Washington at 2000 to 7000 foot elevation; in Oregon at 2500 to 6100 feet; in British Columbia from sea level to 5000 feet and in Alaska from sea level to timberline at 3000 feet.
Staminate cones open in great numbers all over tree in late winter. Pistillate, with 25-40 light yellow scales. Cones mature second winter at length of 3½ inches and width of 2¼ inches, dark reddish-brown. Seeds are compressed, to ¼-inch long, light brown and with wing broader than the seed. Chromosome number, 44.	Staminate flowers are 3-4 inches long and cylindric. Pistillate cones are to 8 inches across and in general spiny egg-shaped. Oblong wingless seeds are to 1 or 1½ inches long, are slightly compressed, and when they germinate the cotyledons remain below the soil surface. Reproduction is by seeds or by shoots.	Staminate flowers or cones appear in January at ends of short branches of previous year, in loose, purple, 4-inch clusters. Pistillate near ends of branches of previous year become globular cones to 1 inch through, rough and without stem. Seeds weigh 4800 to the pound, with 100 pounds of cones yielding 50 pounds of seeds, 40% germination.	Staminate and pistillate cones on separate trees appear in January-April. Seeds mature in September. Cones to 1 inch long, light red-brown, with 6 woody scales. Seeds may be planted in spring, or plants reproduced by cuttings made in late summer, rooted under glass. Seeds abundant every 2-3 years.	Staminate flowers on lateral branches of previous year, of 4-5 stamens, yellow; pistillate, at ends of upper branches, liver colored. Both borne on same tree; mature in September into small spherical conest o ½-inch through, dark red-brown. Seeds numbering 2-4 under each fertile scale, about ¼-inch long with thin red-brown wings.
About 91,000 seeds to the pound. Bark is excellent heat insulator; that of copper has thermal conductivity of 2700; of aluminum 2700; of hair fiber .25 and of bigwood bark fiber .26. Some known to have lived more than 6000 years. Squirrels help plant seeds, one squirrel having collected 26 pounds of seeds in 12 hours.	Plant is at its best in moist valleys having heavy loam soils. To remain beautiful they must be protected from violent winds, which may break the brittle branches and spoil the symmetry of the whole tree. This is probably the hardiest of the *Araucaria* species. Most of these are considered as at best south of United States.	Seeds planted in spring in nurseries, or cuttings started in water or in water-soaked sand. Buttresses provide broad base of value in keeping tree erect on soft soil of swamp. Cypress knees of buttresses reputed to be value in respiration but may be merely mechanical reinforcement of root system or stem.	100 pounds of cones yield 3 pounds of seeds weighing 297,000 to the pound. Wood has specific gravity of .35, 1 cubic foot green weighing 45 pounds. It is durable, has excellent workability, holds paint and glue well and resists decay well. It kiln-dries nicely and stays in place in structures well.	Seeds weigh 460,000 to the pound, normally, with a germination of 84%. Wood has specific gravity of .31, works well, resists decay well, holds paint and glues very well and remains in place well. It holds nails only moderately well. It is hard, rather brittle, nearly white, durable and with little sapwood.
Wood used for fencing, construction, for shingles. Bark, of course, used for insulation against fire and against heat loss. Possibly the oldest living thing and certainly one of the oldest and largest. Is being preserved in parks and special forests, we hope forever.	Commonest use of plants, of course, is as an ornamental, but in native land the lumber has a valuable use and in some parts of South America the seeds may be the chief foods of primitive people. The name monkey puzzle is probably based on the difficulty a monkey would have in trying to climb a tree so well protected by spines.	Wood of great value in furniture, piles, fence posts, cratings with specific gravity of .42. 1 cubic foot of green wood weighs 51 pounds; of dry, 32 pounds. 1000 board feet of lumber weighs 2670 pounds. Cypress railroad tie lasts 8.3 years as contrasted with 4 years for loblolly pine. Food and shelter for wildlife.	Wood is used in laths, furniture, flume construction, shingles, fencing, for interior and outside finish of buildings. Unfortunately it does not hold nails too well, and may be injured by dry rot under some circumstances.	Wood used in making boats, carpentry, cabinets, in furniture, and the interior furnishings of houses. The tree is often grown as an ornamental and has recognized merit as an anchor for eroding soils. Its use as an ornamental is largely in western and central Europe, in the middle-Atlantic States and California.

(*Continued from page 475*)

the title *The Trail of the Lonesome Pine* alone creates an atmosphere that, to me at least, is as interesting as was the novel itself. If we wanted to step off into the realm of punning we could well wonder what would become of jukebox verse and patter if we did not have the word pine with which to play. Maybe it would be just as well if we could cut down quite a bit on that sort of stuff, but then Tin-pan Alley might have to give up solid gold Cadillacs for tin cups. In some cases that too might not be a bad idea.

Our cone-bearers have figured prominently in *The Bible*, and in religious customs of many peoples. Junipers, pines, balsams and cedars are mentioned in this literature and usually to provide a satisfying setting for worthwhile experience. In Isaiah 60-13 we read that "The glory of Lebanon shall come unto thee, the fir tree, the pine tree and the box." At least two-thirds of those trees are conifers. Again in Isaiah 41-19 we find a suggestion of modern reforestation when promise for a better future uses as a vehicle the statement "I will set in the desert, the fir tree and the pine." Somewhere I once read, but connot now locate the statement, that the: "Noble pine is the emblem of the promised prosperity of the church." Maybe some of my readers can help me locate that reference. I am sure that it is approximately correct as it stands, although I had to pull it from a musty file in my memory.

Lowell has said: "The pine tree is the mother of legends," and of course this must apply with equal emphasis to some other conifers. We have already mentioned, in the chart section and in the text, the role the yew tree has played in being identified with the Yuletide which we are soon to celebrate. We might also show that bows made of yew wood shot arrows that help win many battles, but it is doubtful if these battles always went to the righteous side when the victory was toted up. If yew bows had always been on the right side then we would have a legend worth talking about. Possibly some day someone will start such a legend, and if it is repeated long enough and loudly enough it may get general recognition and become accepted as fact. This would be no more strange than some of the things we learn to accept about tobacco, toothpaste, automobiles and beer in our modern televised world

16. Bald Cypress

17. Incense Cedar

18. Alaskan White Cedar

But let us not end on a cynical note. One of my favorite unknown poets once wrote,

"Pine trees are proud trees. Pine trees grow tall.
Pine trees never curtsey to the stars at all."

I like the lilt of that verse, although I do not accept the statement as being true. I much prefer Rupert Brooke's "Pine-trees and the Sky: Evening". In this he uses our pine tree against the sky as a remedy for complete discouragement. I have repeatedly used it as a medicine in my life, and you may wish to try it. The verse from this poem reads:

"Then from the sad west turning wearily,
I saw the pines against the white north sky,
Very beautiful, and still, and bending over
Their sharp black heads against a quiet sky.
And there was peace in them; and I
Was happy, and forgot to play the lover,
And laughed, and did no longer wish to die;
Being glad of you, O pine-trees and the sky!"

Some may wish further references about our cone-bearers, and for these the following list may be helpful. Of course other references have been used in the preparation of this insert and to all of these acknowledgment is made.

L. H. Bailey. *Manual of Cultivated Plants*, The Macmillan Company, New York. 1116 pages. 1949.

Nathan A. Bowers. *Cone-bearing Trees of the Pacific Coast*, McGraw-Hill Book Company, New York. 169 pages. 1949.

H. B. Brown. *Trees of Northeastern United States*, Christopher Publishing House, Boston. 490 pages. 1938.

Alfred Rehder. *Manual of Cultivated Trees and Shrubs*, The Macmillan Company, New York. 930 pages. 1934.

C. S. Sargent. *Manual of Trees of North America*, Houghton Mifflin Company, New York. 910 pages. 1933.

W. G. Sheat. *Propagation of Trees, Shrubs and Conifers*, The Macmillan Company, New York. 479 pages. 1948.

United States Department of Agriculture Yearbook for 1949. *Trees*. 944 pages. 1950.

PHOTOGRAPH BY EDWIN WAY TEALE

Dooming the Dunes

BEGINNING at Gary and stretching for twenty-five miles to Michigan City, Indiana had an unsurpassed possession of Lake Michigan shoreline—the justly famous Indiana dunes. For many centuries the lake has been piling sand along this shore, with the aid of the winds creating a dunes area extending for about one and one-half miles inland. The centuries have seen, too, the establishment here of a floral meeting place of plants of desert, pine woodlands, prairie, oak woods and swamp. More than three hundred different species of birds pass through the dunes in migration, and some one hundred kinds nest there. It is an area entitled to be called *unique* in the purest sense of the adjective.

In the mid-twenties and after a decade of campaigning, foresighted Indiana women led a drive to have the State establish the Indiana Dunes State Park. Thus were preserved three miles of lake shoreline as a recreational area, and some two thousand acres of the dunes country with its botanical and animal treasures. In summer the beach is taxed beyond its capacity and the trails and roads through the park attract many visitors.

Urban and industrial development have been edging out into the dunes. Today the amount of unspoiled area has contracted until there is little more left than is enough to double the size of the present park and protect the shoreline. Indiana has the opportunity to do this, and certainly the public need is amply demonstrated.

Arrayed against this proposal in the public interest are political and industrial pressures that seek to dip into the Federal pork barrel to create a harbor of highly dubious economic justification. The projected harbor would be dredged and cut into the dunes at a point nine miles east of Gary. There, a generation ago, a shallow channel called Burns Ditch was dug to drain swamp lands behind the dunes and make them into fertile farms. Currently land in this vicinity is being quietly purchased for undetermined interests and future industrial developments, the polluting wastes of which would certainly doom the present park beach.

It is always difficult to stop the momentum generated by interests after a quick dollar and teamed with individuals seeking political prestige. These are, however, the forces that would doom the dunes.

In defense of the dunes stand the Save the Dunes Council, the Izaak Walton League, the Garden Clubs of Indiana, the Indiana Federation of Womens Clubs, American Legion posts, conservation organization and many individuals. The Council has acquired the marvelous Cowles Tamarack Bog, a fifty-six acre lost world where wild flowers almost extinct elsewhere in the United States still flourish. But the major task remains. As much of the dunes as possible should be saved.

No local area of unique or outstanding significance, either scientifically or recreationally, is really a matter of purely local interest. Conservationists fought successfully to protect Dinosaur National Monument from invasion by a great dam. The State of New Jersey stepped in and purchased Island Beach, thus preserving the last stretch of unspoiled beach and dune in that State. The National Park Service, thanks to the foresight of the State of North Carolina, now administers the Cape Hatteras National Seashore Recreational Area and thus assures protection of this splendid region for generations to come. These and other examples of foresight are of national concern. Saving for posterity some twenty-five hundred more acres of Indiana's vanishing dunes is no less so.

The Save the Dunes Council, and other Indiana conservationists need your help. They will be strengthened in this fight by your expression of interest and support. A dollar, or more, sent to Mrs. Howard Johnson, Treasurer of the Council, at 509 Ogden Dunes, Gary 5, Indiana, will be tangible evidence of your concern. The Council will be glad to send further information.

The woodcock on its nest is nicely camouflaged from observation by the casual passerby.

Wildlife biologists use ingenuity to learn the facts of

Life with the "Timberdoodle"

By ROGER M. LATHAM and STEPHEN A. LISCINSKY

Photographs by Steve Liscinsky

As soon as winter breaks in Pennsylvania, often as early as late February or the first week of March, a small brown bird no bigger than your fist flutters out of the sky like a falling leaf and settles in a brushy old field just at dusk. The first woodcock has returned from its fifteen-week vacation in the South. It probably left Louisiana, or some nearby State, as much as a month earlier and worked its way northward in short, easy hops. Down there it was called a *bécasse de nuit*, or "bec" for short. It has upwards of thirty other local names, including timberdoodle, bog-sucker, owl snipe, wood snipe, big-eyes, and swamp partridge.

Woodcock are one of the first of the migratory birds to return and establish residence. And they get right down to the business of mating and nesting just as soon as they get their feet nicely on the ground. About the time the "spring peepers" are heralding the coming of spring with their shrill clamor from every wet spot, Papa woodcock picks out a nice clearing adjacent to his favorite haunt and starts his courtship antics.

Although less spectacular than the strutting of the wild turkey, the "booming" of the prairie chicken, or the drumming of the ruffed grouse, the aerial courtship display of the woodcock is exceedingly interesting. Unfortunately, he puts on this show when it is too dark to see well. Not a movement or a sound comes from this Don Juan of the swamps until the last color is gone in the west and the night shadows have descended. But just as the light intensity reaches a certain point, he flies out of his daytime hiding place and lands in the middle of his little clearing. On successive clear nights you can almost set your watch by this first appearance.

Then, with his tail spread in a jaunty fan and his chest stuck out like a pouter pigeon's, he struts much like an old tom turkey—peanut-size. He takes a few quick steps, wings dragging and talking to himself in a low voice, then suddenly contorts his body and emits a loud startling *beep* followed by two very low cooing notes. This *beep*, or *peent*, can be heard for a quarter of a mile on a still night, and it sounds much like the note of the nighthawk as it chases insects over a city during late evening.

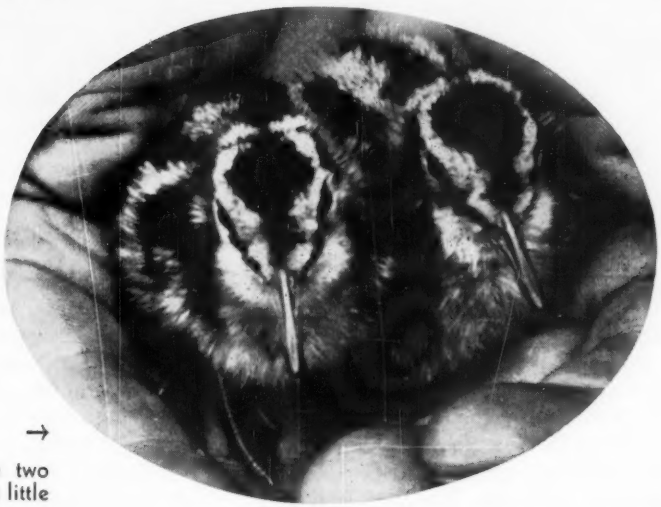
The strutting and beeping may continue for a minute or two and then suddenly the bird springs into the air

A clutch of woodcock eggs in the nest.

pointed like all shorebird's eggs, are laid in a matter of five days to a week and then incubation starts. About twenty days later she has a family.

All this takes such a short time that some of the chicks hatch as early as the first week of April in Pennsylvania. This means that these hardy mothers occasionally sit in the snow, but they usually manage to keep their eggs warm. Unusually cold weather can mean many nests lost.

The chicks are ready to leave the nest as soon as dry and development is extremely rapid. Within two weeks they can fly, and in a month they are as big as Mamma. Evidently the earthworm diet is excellent for growth and these birds eat unbelievable amounts of them. They



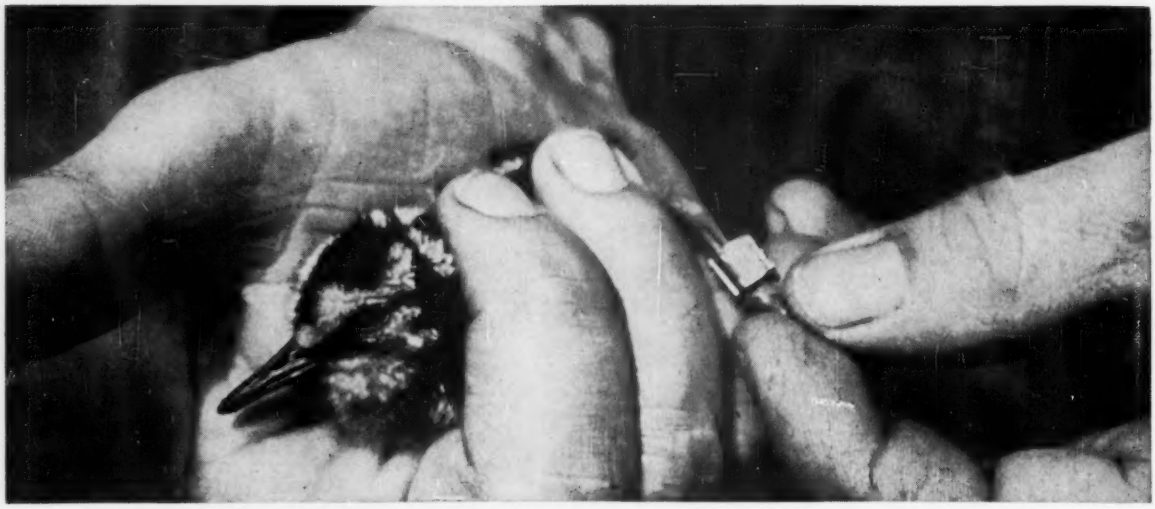
These woodcock chicks are two days old but quite self-reliant little fellows. →

The holes in the ground show that a timberdoodle has been probing for worms at this spot.

on his first courtship flight of the evening. He ascends rapidly in spirals, wings whistling as he goes, until he reaches a height of two or three hundred feet. At this point he vocalizes ecstatically, sweeps about in a wide spiral and begins his descent. Down he comes at great speed, diving, sideslipping, and falling, all the while giving forth an increasingly sharp chirping and warbling that is quite musical for a game bird. The woodcock lands with a sweep, struts a few steps, and begins to beep all over again. This whole procedure is repeated about ten to twelve times during the next half hour. If the moon comes up bright and full, he may renew these antics intermittently for several hours. The performance is given again just at dawn.

If the male is a lucky suitor, his lady fair will be waiting for him when he completes one of his flights. After all, that was the reason for all his effort—to let her know where he could be found.

Once mated, she gets her nest built in a hurry. What a terriffic construction job this is! She squats down somewhere in the leaves or grass, usually at the edge of some brushy cover, wiggles and turns a few times, and the nest is completed. The four eggs, big and sharp-



A band is placed around the leg of a day-old woodcock chick. Since its leg will grow little in girth the band may safely be placed at this tender age.

have an especially adapted digestive process that includes an intestine long enough to encircle this entire page. When a long worm starts down their gullet as a full-course meal, the front end is long since soup before the tail end becomes dessert.

The Pennsylvania Game Commission, as well as wildlife departments elsewhere, have biologists trying to find out all they can about the woodcock so that adequate numbers may always be maintained for those interested in observing the birds and those interested in it as a game bird. They want to know where the birds hatched and raised in Pennsylvania, or other States, go for the winter. They want to know how long they live, and whether they come back to the "old stamping grounds" to nest the next year and the next. They want to know how many of these local birds are represented in the hunter's bag, or how many are woodcock that have migrated down from more northern States and Canada.

The best way to learn the answers to these questions is to leg-band as many birds as possible. Clever technicians have figured out ways to take advantage of some of the woodcock's peculiarities to get this job done. For example, they discovered that the courting males could be captured alive on their singing grounds. They devised an automatic net trap that lies flat on the ground when set, but claps together like a giant clam when the trigger is touched. And do you know what they use for bait? Sex! Yes, a mounted specimen is placed right on the trigger and the extra weight of the lovesick male is all that is needed to set it off. Funny thing, love must be blind in woodcock land as well, because the mounted Loreli can be male or female, or even a painted wooden dummy.

There are other ways to catch woodcock, too. Because their eyes shine in an artificial light after dark, they can be captured with a long-handled net and a powerful flashlight. However, the birds must be approached almost noiselessly or they will flush before the net can be used. And because they are so widely scattered almost everywhere, except on their wintering grounds in Louisiana, the number captured is likely to be small. In the southern States during the winter, they may feed by the hundreds in open pastures, where stalking and netting is much easier.

Well-trained bird dogs can be a big help after the chicks have hatched. When the dog stiffens out on point, boys walk up and clap a net over the young birds. These youngsters have such big feet that a full-sized band can be used and will stay put for the rest of their lives.

The final way of getting birds to band is to set out fancy contraptions called cloverleaf traps. In the middle is a circular cage made of chicken wire, with fish netting on the top so the birds will not scalp themselves. Running out from this main compartment are two or three leads that intercept the feeding birds and direct them toward the trap. The entrances are ingeniously contrived so that the birds will go in but can not find their way out again. These work best in late summer and early fall when the weather is dry and the woodcock are concentrated along the streams and spring runs.

The Pennsylvania wildlife men make a careful count of their breeding stock each year, as others do all over the eastern United States and Canada. This is done by counting the number of singing males on specified routes. Each route is run three times at about five-day intervals. All of the cooperators in the various States and Provinces follow the same pattern so that the results will be comparable from place to place and from year to year.

The census taker starts at a given point just at dusk. When he hears the first *peent*, he jumps in his car and dashes down the road four-tenths of a mile, gets out and listens for two minutes. He continues to stop every

A male woodcock captured in a live trap on the singing field. They can be decoyed into the trap by a stuffed bird, or even a wooden one.

Measuring the bill of an adult timberdoodle to determine its sex. The bill is equipped with a flexible tip end that "feels" for worms.

four-tenths of a mile until he has completed his run of two or more miles. All of this data, when put together, gives the U. S. Fish and Wildlife Service and the States the information they need to set proper seasons and bag limits and to take care of the maintenance of the species.

In Pennsylvania, the biologists are doing far more than just band and census the woodcock. They are trying to find out how to improve living conditions for them as well. The timberdoodle is essentially a bird of creek bottoms, moist areas, and old fields grown up into sparse brush. Black alder, hawthorn, crabapple, aspen, gray dogwood, and silky dogwood are the most common trees and shrubs making up good woodcock habitat. Usually a new patch of alder or aspen will produce good living for no more than fifteen to twenty years if undisturbed. Then something happens to the vegetation, or to the soil, or to the amount of moisture in the ground, or to the supply of woodcock food. Probably it is a combination of these factors. Anyway the research men are trying to find out just what it takes to restore these "worn out" coverts to productivity again.

This is an intricate problem because of the exacting living requirements of the woodcock. Take its diet for instance. Day after day it eats yards and yards of just plain old fishing worms, and when it cannot get enough in one spot it moves to another. The bird gets these slimy delicacies by sticking its three-inch bill into the moist soil, grabbing one by the waist, and pulling with all its might. In rainy weather many worms may emerge after dark and crawl around on the surface, simplifying feeding and avoiding the need to dig for worms.

The woodcock is really equipped for this business. The tip end of its upper bill is flexible like a finger, and it can actually "feel" for the worms. A muscular bullneck aids in pulling the larger ones out of their subterranean homes. And because the woodcock would otherwise be vulnerable to its natural enemies with its bill buried in the ground, the oversize eyes are set almost on top of the head so that it can see straight up, front, back, and sideways all at the same time.

If worms are not to be found in a particular covert, the birds will not be there either. And if the soil is too dry, too wet, too sandy, too acid, or too anything, there will be no worms, or they will be too deep to be reached with a three-inch bill. So, the biologists are trying all kinds of experiments to find out what needs to be done to produce woodcock in spots where they were once abundant. Wildlife workers are thinning the trees and shrubs by cutting or spraying to let more sunlight into the soil and create a better ground cover of grass and other low-growing plants. Where large elms, maples and similar timber trees are shading out the alder and other desirable woodcock cover plants, these have been cut down and sold for lumber. Cattle are even being grazed in some of this dense vegetation to see whether they will do the "thinning" job.

Sometimes there are too few trees and shrubs, and the mat of grass and other ground plants is too thick. Alder and gray dogwood seedlings have been planted in old moist fields where brush cover (*continued on page 500*)

General erosion conditions northwest of Ducktown in the Copper Basin Desert of southeastern Tennessee as they were in April, 1942.

Desert in the Appalachians

By JESSE C. BURT

It would be hard to beat western North Carolina and eastern Tennessee for inspiring scenery. Especially is this true where the two States come together. This is one of the important natural areas of the United States.

Fortunate, indeed, is the traveler who visits this region of vaulting mountains and takes the time to savor the fresh mountain air, the song of birds, and stays for a while at one of the numerous overlooks along the highways to glimpse the deep, green valleys below.

Here are mountains whose names are magic—the Blue Ridge, the Great Smokies, preserved as National Parks. Here are magnificent stands of trees, delighting city visitors. These mountains, trees, plants, flowers, grasses, and wildlife give the section a powerful claim to be regarded as "God's Country!"

But wait just a moment! There is one portion of this famous natural paradise where man's abuse of his greatest resource—the land—provides dramatic contrast. This is the Copper Basin of the southeastern corner of Tennessee, right where the State line meets the line of its parent, North Carolina, and the line of Georgia. Here there is a unique, man-caused, shocking, 23,000-acre desert.

Historians date this Copper Basin Desert back to the last century, when man's attitude towards the land was largely that of a predator. Although no isolated example of abuse, this desert in the Appalachians is a profound object lesson for all who would put conservation in quotation marks.

The traveler reaches the Copper Basin Desert by several routes, but the one used most gives the sharpest contrast. This is U. S. Highway 64. As one comes into Tennessee, two things happen. The speed limit leaps up to 65 miles an hour, and there are those who give it a try on a most curving road. The other change comes stealthily, with creeping horror.

Trees begin to thin out; grasses, vegetation become sparse, even in the garden of the southern Appalachians. Then an explosive emotion assails the traveler; he has reached the naked, rolling hills of the Copper Basin Desert!

In green East Tennessee, this is red land. Spread before the eyes is a landscape of eroded hills, deep gullies, bleakness. And all of this came from looting forest resources, from over-grazing the grasses, from "burning-off" the brush and weeds, and from poison in the air and poison that seeped into the ground. As the landscape became more and more denuded, the rain, sun, and wind became more and more deadly. The net result of all this was an incredible wasteland.

Today, many of us give lip service, at least, to conservation, whether we practice it or not. So it is that,

invariably, tourists are nearly frightened by the vistas of devastation on display at the Copper Basin Desert.

The effect of this Desert is terrific on the emotions. Frequently tourists have to pull off the highway to recover themselves. A shrewd restaurant operator located a place called "The Sahara" just where Highway 64 reaches the Desert.

The Copper Basin is one of the important industrial centers in the United States. For more than a century, this rich basin of Tennessee has mined copper, one of the key metals used in hundreds of things, from automobiles to pennies. Once there were five companies operating in the Copper Basin.

In the years after the Civil War, copper was smelted by the so-called roasting method. By today's standards, this was crude and inefficient. The copper-bearing rock was put on a pile of cordwood, and then the wood was set on fire. The heat released sulphur fumes from the rock, which had to be done to obtain copper.

As early as 1874, the Tennessee Department of Agriculture issued a stern warning about the free and easy cutting of the trees to supply the cordwood for the smelting. The Department noted that the hills were being denuded. This was, it said, bad practice!

But there was no attitude that the trees would play out, no more than there was any feeling against "burning off" in the fall. The easiest way to clean-up an area seemed to be to burn if off.

During this time, too, sulphur dioxide was freely released into the air. It has severe effects on vegetation and trees. In trees, it can cause the vital chlorophyll to decompose. It can destroy plants because it interferes with their photosynthesis. Such words as "choking" and "cloaking" are used in technical articles to describe the poisonous effects of sulphur dioxide.

By 1900, the results of erosion were clearly to be seen in the Copper Basin. Then, around 1904, it was discovered that the waste fumes from copper smelting produced sulphuric acid. Sulphuric acid, as any high school chemistry textbook will indicate, is one of the most valuable chemicals known to man. It has hundreds of industrial uses! This discovery clamped down the lid on the casual release of waste fumes into the atmosphere. It became practical to retain them.

But there had been an epoch of utter devastation, one of large-scale proportions. Even today, when the Copper Basin Desert is trying to fight its way back, it stands as a sobering example of the ultimate in land abuse and consequent erosion.

In 1942 trees were planted on this gullied section of the Copper Basin Desert. (Below) Five years later.

(Below) By 1956, thirteen years after initial preparation, trees and other vegetation began to win.

Consider the thoughtful words of Dr. L. W. Glenn, a noted geologist: "The result of the erosion in the region may be looked upon as the goal to which all erosion in the southern Appalachians is tending. If elsewhere in the southern mountains, the cover of vegetation is removed as completely. . . the rapid erosion that has wrought the destruction seen there may confidently be expected to follow, and with like results."

Erosion to the ultimate has taken place in the Copper Basin Desert, and has carved out a desolate wreck of a landscape. Viewed from the air, the cancerous gullies in the surface of the naked, red earth are puckered and drawn like scars. Viewed from the ground, and with a mind aware of how erosion works, these gullies seem to be attacking the earth, almost as you watch. In the rain, the drops fall like bullets. With nothing to hold the water, for years it slashed at will, making gullies deeper, deeper; making systems of gullies where there had only been one before. Some of these gullies are deeper than the tallest basketball player is tall.

An air view from 4000 feet of the man-made desert of the Copper Basin, Tennessee.

Invariably, at least in recent years, the traveler has demanded, "What's being done about all this?" It is a wasteland he can see. He does not like it. It offends his sensibility. Sometimes the exposure to the Copper Basin Desert is good. The traveler takes home a fierce interest to support conservation in his own territory.

Since 1939, the Tennessee Copper Company, organized in 1899, and now the only industry in the Copper Basin Desert, the CCC, the TVA, and various public conservation agencies, have worked together to try to recover these 23,000 acres of barren lands.

For a decade before 1939, Tennessee Copper Company saw the need for reforestation, according to an article in the *Journal* of the Tennessee Academy of Science. This early experience brought out two facts that are of utmost concern to any community where there is a problem of land use or abuse:

1. It is going to take a long, long time to come back to what once was man's, and which he treated as the most relentless predator on the surface of the globe;

2. Reforestation is no simple matter of making a hole in the ground, plumping in a seedling, and letting Nature take her course.

For example, there is the matter of protective plant cover to fix the soil until trees become established. There has been notable experimental work in the Copper Basin Desert since 1941, by TVA, and others, and some of the results are impressive.

The experimental work included the testing of cover plants, black locust, and pine on 90 plots involving 569 sample units. The Copper Basin Desert is anything but ideal for reforestation. It has been necessary to determine what cover plants, what trees, are rugged enough to live there, where the topsoil has long ago been washed away. All this has taken time; years.

Of the more than 20 cover plants tested, weeping lovegrass, introduced from East Africa, developed. The name of this grass seems strangely appropriate for such a barren land!

Of the 17 species of trees tested, only Japanese red pine and the four native pines, Virginia, pitch, shortleaf, and loblolly, showed promise of survival. Loblolly is used for extensive planting on the basis of its rapid growth and good survival. Tree plantations have been made with fair success on 1300 acres.

As the visitor looks over these trees, and meditates upon the conditions of life that a given tree must have, he realizes that there is underway, before his eyes, a grim war of survival. This is another indication of the sheer drama that is part of the desert in the Appalachians.

For example, here is a small limb carefully removed by a forester from a Virginia pine. It illustrates a point. A canker worm has attacked this limb. So much of the vitality of the tree is consumed in fighting its way downward and upward to life that its resistance is sharply lowered. Thus it is prey for the enemies that come in legions to attack.

Fifty inches of rain hammer down on these barren hills every year. In a period of 17 years, the U. S. Forest Service, and TVA foresters found that as much as 16 feet of soil had disappeared in the path of advancing gullies. There has been an annual loss of 482 acre-feet of soil in an area of 4450 acres in the center of the Copper Basin Desert. As Jack S. Rothacher, (*continued on page 499*)

Sandra Behrend of the Newark Museum staff holds "Ma" the popular and remarkable pilot black snake.

Long a "spinster" black snake, Newark Museum's

"Ma" Makes Records

By NANCY BAKER

A LOVELY lady has been charming the Newark, New Jersey, Museum's Nature Corner staff and visitors for the past seventeen years. She is a pilot black snake affectionately known as "Ma."

Of course, it may be a matter of taste, but Nature enthusiasts, at least, are quite intrigued by this elongated lady, who is five feet, rather plump for her kind, has a spotted underside and reproductive proclivities. This last may not seem too unusual, unless one stops to realize that Ma may be the oldest living snake of her species in captivity, not to mention the fact that she only has one oviduct. This black snake was fully mature when found in Bernardsville, N.J., in 1939, making her about three years old at the time and twenty years old now.

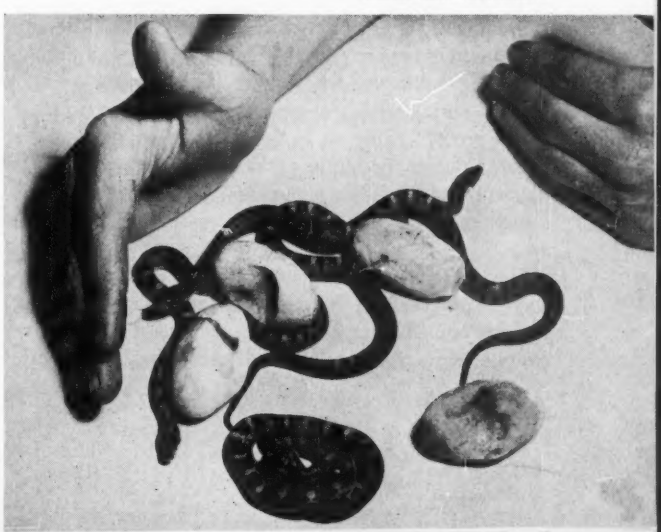
For fourteen years Ma lived a comfortable but isolated existence in the Museum's Nature Corner. It was not until she met "Junior," three years ago, that there came a change. Junior is the Nature Corner's comparatively new *Elaphe obsoleta obsoleta*, which is the scientific name for a pilot black snake.

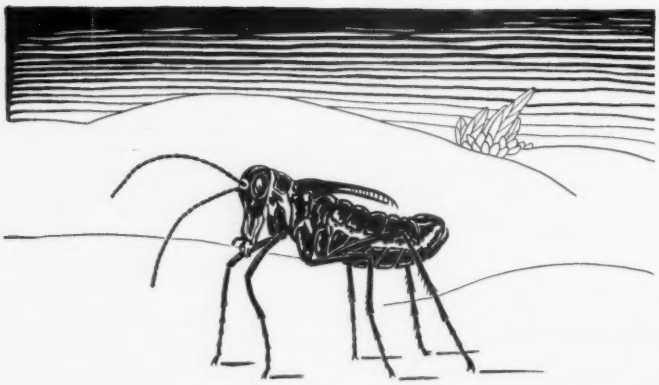
In the spring of 1953, Ma laid two fertile eggs, but she was unable to lay the remaining three, which were abnormally large. So, it was clear that surgery was in order. Ma was sent to the Staten Island Zoo, where Carl F. Kauffeld, Curator of Reptiles, performed an operation on her, actually a reptilian caesarean. Mr. Kauffeld could not believe that Ma was as old as she was: "Why, she looks like a young snake!" he exclaimed. In the course of this operation, pieces of one of her oviducts had to be snipped off, making it nonfunctional, according to Mr. Kauffeld. After her ordeal, it was advised that Ma be returned to her isolated existence. However, the following spring, 1954, she laid five more eggs. Snakes have a way of doing this, so it was decided that she should be put back with Junior since she was going to go ahead and lay eggs anyway. In the spring of 1955 she laid five, and this spring nine, and without too much difficulty. An effort was made to preserve the latest clutch. Due to the great care and attention they require, none had been hatched in previous years. This year Ma had laid her nine eggs by May 17. On July 26 three baby snake heads popped out of the eggs, and the young were all out the next day. A fourth egg hatched during the following weekend. This success was apparently due to a new technique of care used by Alan Mahl, Junior Museum Supervisor. In previous years the eggs had been kept in wet sand. This year Mr. Mahl wrapped them in moistened paper towels, changing these as frequently as possible to prevent mold.

Pilot snakes are the largest serpents of theno rtheastern states, growing to a maximum length of about eight feet, five inches. The pine snake, often thought to be the longest of this area, grows to a maximum of seven feet. Being of a rat snake group, they are constrictors, and there are few small mammals or birds that are safe from the strength of their coils. Ma, however, is a little too weak to engage in the chase, so her tasty dish of about three mice every two weeks is served up in a defunct state. Of course, unlike most snakes of this area that hibernate for the winter, she eats all year around, So, this menu, although it may (*continued on page 499*)

After many years of isolation, "Ma" met Junior. After four years of egg-laying some of her eggs hatched.

NEWARK NEWS PHOTOGRAPH





Side view, Boreus adults look somewhat like miniature horses.

Boreus, the Snow-sprite

By LEWIS J. STANNARD, JR.

When winter begins, and while most other insects are hibernating, the snow-sprite, Boreus, stirs into full activity. On mild winter days from December to February this insect can be found in our northern woodlands, especially where there is a thick carpet of moss. Whenever air temperatures are forty degrees Fahrenheit or higher, Boreus is apt to be about, apparently unmindful of any existing snow, instead only mindful of the mate he seeks.

Snow-sprites are tiny insects averaging about an eighth of an inch in length. The adults of most species are jet black or dark brown in color. As a result they show up in sharp contrast to snow but are well camouflaged when in the shadows of mosses. Their heads are long and drawn out and, in side view, Boreus adults look somewhat like miniature horses. None can fly for their wings are reduced to modified pads. Yet despite their lack of wings they can propel themselves through the air many, many times their own length by powerful leaps. On a proportional scale, even a grasshopper would be envious of Boreus' agility.

Presumably after a brief winter "honeymoon," Boreus' mate lays her eggs in mosses. Out of these eggs eventually come small grub-like larvae. During the rest of winter, spring and the earlier part of summer these young grow, feeding on moss roots. When fully grown in late summer the larvae make special vertical tubes in the soil and there they pupate. When winter comes again they emerge as adults to start another yearly life cycle.

Certainly it is to be wondered what evolutionary influences produced an insect with wintertime preferences. Perhaps one advantage gained by Boreus is the relative safety of winter because of the dearth of predators, quite in contrast to the conditions in summer when such as hunting wasps, tiger beetles, and spiders are always lurking about.

But more than likely Boreus' evolutionary development was derived from other more subtle causes than that of a danger-free winter. The winter habit crops out several times again in distant relatives of Boreus, even in such far away places as Australia. Possibly the ability to enter and successfully to survive in the winter niche is a peculiar evolutionary tendency inherent in the group to which Boreus belongs.

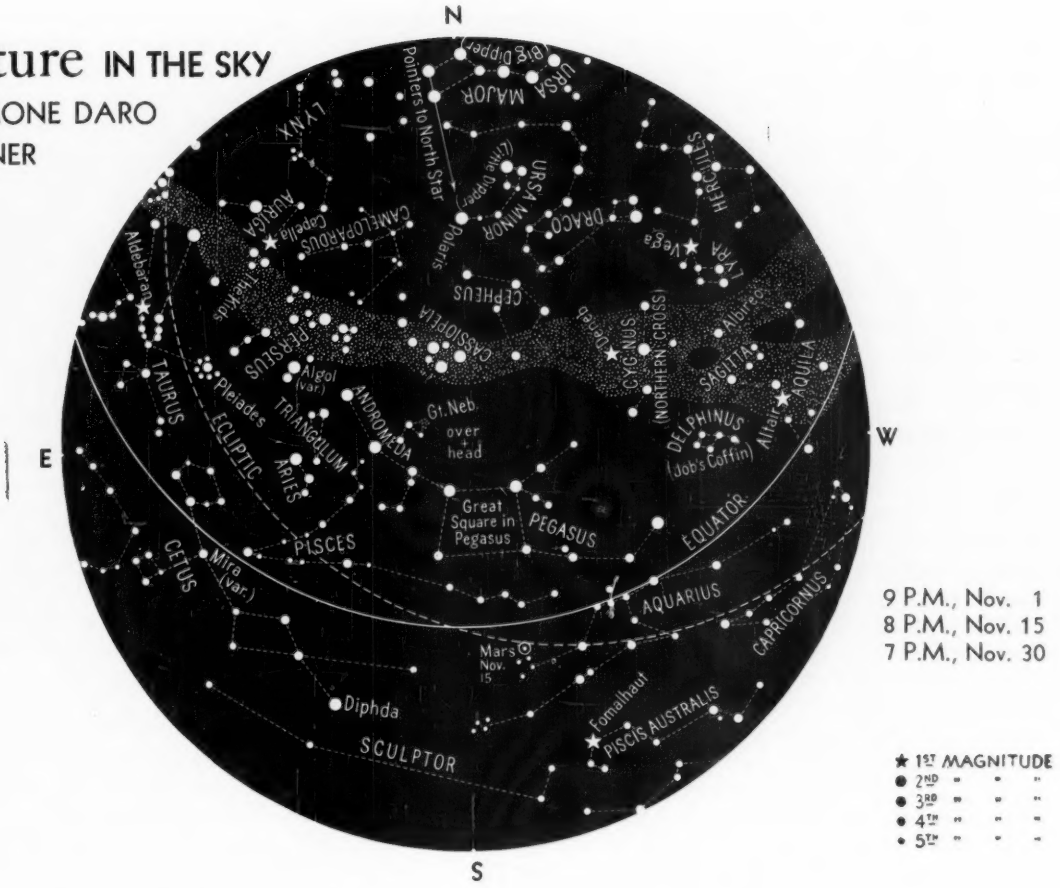
Boreus and his relatives are referred to collectively as the Mecoptera, the order of insects commonly called scorpionflies. Millions of years ago, according to our interpretation of the fossil records, the Mecoptera were abundant insects. Whether Boreus existed then is not known. His numerous ancient relatives were much like the few remaining ones left today. Most were fully winged and many had typical long, drawn-out heads.

Besides the species of snow-sprites, there are at present fifty or more species of Mecoptera in our country and each one of these lives in deep, damp woods. All the winged scorpionflies are summer forms, all are much larger than Boreus, and all are voracious predators. Mild mannered Boreus, whose only defence is to leap away or play 'possum, has little in common with the fierce temperament of his summer relatives.

About one dozen species of snow-sprites occur in North America. Two species inhabit the northeastern States; the others range from California, Montana, and Wyoming north into Alaska. Our most common eastern snow-sprite, *Boreus brumalis*, is distributed from Massachusetts to Washington, D. C., west to southern Illinois. Although part of our native (*continued on page 500*)

Nature IN THE SKY

By SIMONE DARO GOSSNER



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. Times given are for Local Standard Time.

Minor Planets (II)

To be acceptable, a theory on the origin of minor planets must be consistent with all available data of observation. It must take into account their known motions, their shape and size, and what we know of their composition.

The orbits of minor planets—or asteroids, as they are often called—present widely different characteristics. Most are found in the asteroid belt between Mars and Jupiter, with nearly circular orbits similar to those of the larger planets. Others have much more elongated orbits, comparable to the orbit of a periodic comet, and they often move in a plane that is greatly tilted to that of the Earth's orbit. This latter instance is not found among the major planets. Asteroids with unusual orbits are traditionally given masculine names in order to distinguish them from the more classical ones. Feminine names, believe it or not, are reserved for the less temperamental ones, a fact on which to ponder.

All asteroids for millions of years have been subject to the gravitational pull of Jupiter, by far the most massive of all the planets. These *perturbations* from Jupiter cause the orbits to change gradually over the years, and tend to mask the real motions that these asteroids had when they were formed.

Two decades ago, the Japanese astronomer Hirayama attempted to evaluate the cumulative effect of these perturbations on the motions of individual planets. His purpose was to find out what these motions might have been when the asteroids came into being. His conclusions were that a large number of minor planets can be grouped together into five "families," each family being characterized by the close similarity of the original motions of its members.

More recently, Dirk Brouwer of Yale made a similar

survey of the nearly two thousand asteroids known at present. Brouwer found that he could increase the number of members in Hirayama's families, and he also found indications of the existence of a few more families. On the strength of this evidence one may conclude that, if the asteroids as we know them are the product of the disintegration of a larger planet, it is more likely that there was more than one planet originally, perhaps five or more.

The picture becomes now a little clearer. When the solar system was formed, large planets originated singly within their various orbits. For some reason one exception occurred in the region between the orbits of Mars and Jupiter —instead of just one, a multiple system was formed. These planets would conceivably be smaller, as they would be made up of the material that would otherwise have been used up to form a single large planet.

As they were formed, these small planets found themselves almost—but not quite—at the same distance from the sun. But this very slight difference in their distances resulted, in accordance with Kepler's laws, in a small difference in their speeds (the farther a planet is from the sun, the more slowly it travels). Thus some of them started catching up with each other. This is likely to have caused a few collisions, of the slow, grazing type, but sufficient to shatter the colliding bodies.

Brouwer has pointed out that some of Hirayama's families seem to have been much more recently formed than others. This is not surprising. With every collision the number of asteroids increases, and so do the chances of future collisions. These collisions may not be the only cause of asteroid fragmentation. If an asteroid spins too fast on its axis, the centrifugal force that results, coupled with the tidal force from Jupiter's attraction, will eventually cause a breakup.

Considerations of celestial mechanics, such as those we have summarized above, are not sufficient to support the theory of fragmentation. They merely show how it could have happened. The strongest evidence of this theory is furnished by the observation of the brightness variation of these objects. Many of them exhibit large variations in brightness over a period of a few hours. This is precisely what would be expected of an irregularly shaped object rotating on its axis. As a matter of fact, the irregular shape of Eros (asteroid number 433) was actually *seen* at the time of its close approach to the Earth in 1930-31. In contrast, Ceres and Pallas, the two largest asteroids, are approximately spherical. They may well be two of the original minor planets that have miraculously escaped fragmentation.

It remains to explain why more than one planet was formed in that critical orbit between Jupiter and Mars. This is still a very speculative subject, as it is relevant to the complex problem of the origin of the solar system. Many theories have been advanced since Laplace formulated his famous nebular hypothesis. Most of them, unfortunately, fail to account for some of the observed facts and have been rejected on that basis. The most recent, and, to this date, the most acceptable, is the theory suggested by G. P. Kuiper, of the Yerkes and McDonald observatories.

Kuiper starts with the assumption that the sun was originally surrounded by a nebula. This nebula would rotate around the sun in a familiar fashion—that is, the parts close to the sun would rotate more rapidly than those farther away. This outward decrease in the speed of rotation would create shearing effects between the concentric rings, and turbulent eddies would form, the largest eddies appearing in the outermost rings. Kuiper points out that, in general, these eddies would not be long-lived. But, once in a while, an accidentally formed eddy might be denser than a certain critical density, and would become more stable against the effect of tidal forces. That eddy would gradually condense into a "proto-planet," and, as the gases gradually escape, the planet would be formed.

But when Jupiter was formed it was so huge that the tidal forces it exerted on the next inner ring were such as to prevent the formation of a large stable eddy. Instead, a number of smaller ones occurred, and the original minor planets were born.

As a matter of fact, the influence of Jupiter may even have been felt in the next inner ring. This, according to Kuiper, may have arrested the development of Mars, which, except for Mercury, has the smallest mass among the major planets (one-tenth the mass of the Earth).

At this time, Kuiper's theory is unquestionably the most satisfactory that anyone has offered. All such theories, unfortunately, are at the mercy of subsequent observations. He may have to revise it in the future, but, in its broad outlines, his hypothesis is, indeed, attractive.

MIGRANTS

Pegasus, seeming to touch a nearby tree,
Plunges upward from the distant sea,
While crickets fiddle a symphony
To which the far stars seem to be
Dancing . . . dancing . . . rhythmically
In slow procession up the sky,
Each constellation swinging by
With excessive dignity, moving high
And higher, while, lower, migrants multiply,
Heading southward: twittering as they fly.

Harry Elmore Hurd

In the month of November, the New Moon will occur on November 2, and the moon will be full on November 18.

Mercury will be too close to the sun to be seen in November. It will enter the evening sky on November 12 and will gradually become more favorable for observation as an evening star toward the end of that month.

Venus will be seen in the east as a bright morning star throughout the month of November. In Virgo, it will rise 3 hours before the sun on November 15. Its magnitude will be −3.5. (*continued on page 500*)

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Nature IN THE SCHOOL

By E. LAURENCE PALMER

Professor Emeritus of Nature and Science Education, Cornell University, and Director of Nature Education, The American Nature Association

Evergreens in School

IN MOST SCHOOLS THE EXTENT of usefulness of evergreens in the school program will be limited to their use at Christmas time as ornaments, or as a center for the Christmas pageant that comes and goes with the Christmas holiday.

We have no desire to detract from this traditional use. However, there is further opportunity for study in the school room through the introduction of the real raw material on which much of the material in books is based. A fir Christmas tree is not in the schoolroom every day of the year, yet fir may well have provided the paper pulp from which most of the books in the schoolroom may have been made. It might be well to introduce the tree to the book, the book to the tree, and the children to both of them. Of course, it probably will be impossible to identify the paper on which this is printed as coming from spruce, fir, aspen or cottonwood, but that need make little difference. We probably meet every year humans who are related to us without our knowing it if we could just trace our ancestry far enough into the past.

In the special insert in this magazine we have given considerable emphasis to the role played by the conebearers, not only in our general economy but for their influence on poetry and literature. That emphasis need not be repeated here, except to suggest that there are other equally appropriate associations that might have been mentioned. In how many pictures in a given schoolroom, on a shelf in the library, or in one's home can you find pictures of cone-bearing trees? Do they seem to share equally with the hardwoods, the favor of our artists?

Hardwoods and softwoods

In the realm of language consider the words hardwoods and softwoods and see how truly significant they may be. Certainly if we rely on the classification of conifers as being softwoods, and leave the others in a group we call hardwoods, we will get into difficulties. This rough classification is sometimes given, but not by any youngster who has had experience trying to split a tamarack log or some aspen wood. If you wish to follow this up by all means get one of our references, which should be in your library anyway. It is handbook #72 issued by the Forest Products Laboratory of the United States Forest Service. It is known as "Wood Handbook." In it, on pages 70 to 79, you will find specific data on this subject for most of our common woods. Not only will you find that the "softwoods" are often hard, and the "hardwoods" often soft, but the names may be really meaningless in terms of real hardness.

If you do try to get this useful Handbook you may also get some idea of the government departments that are engaged in problems dealing with woods. In our references we suggest such government agencies as the Forest Products Laboratory, the Forest Service in general, the United States Department of Agriculture, and the United States Department of Commerce. How are these organizations related one to the other?

Careful writing

It might be well to give your students some training in careful writing. We need it. At a recent meeting of the Outdoor Writers' Association of America the program material suggested that one State propagates and cultivates "some 500,000,000 species of fishes annually." Surely they could not mean that. And to make matters worse at this meeting of professional writers we were told in their official journal that "a parking lot—will be used for our convention." Surely they did not mean that either. Maybe this hardwood-softwood business; this male and female cone business; this pistillate and ovulate cone business, discussed or suggested in our special insert on the evergreens, may have some significance to the English teacher. Why cannot they give some background to future outdoor writers. We rather desperately need well-trained persons in that field. This training must be not only in natural history but in the arts of expression as well. As suggested also in the insert, we need this training on the part of those who write the textbooks that are to be used in our schools. It is almost as bad to have a person untrained in the art of expression, but trained in the basic science, as it is to have to read the efforts of someone untrained in the basic science but with superior training in expressing ideas for whose validity they have little authority.

Of course, history finds in the conifers rich significant material. Some years ago *The National Geographic Magazine* ran a number of articles dealing with the reading of history from timbers found in the structures built by the cave dwellers. In museums the country over, and in some old dwellings such as the one built in Philadelphia by the Bartrams, you can find similar significant material for more recent history. Why not carry this idea further and mark on one of the oldest available local tree stumps the political history of the country, as well as records of important events in the field of science, of literature and so on.

Trees and wildlife

Other ideas that might be developed in studying the conifers in the schoolroom could include the role of these trees in providing summer or winter den sites for wildlife; their importance in anchoring the soil on steep or windswept areas; the degree to which local trees are subject to obvious injury by insects, by fungi and by other living enemies. There are such subjects as the proportion of reforestation being done locally in which conifers and other species of trees are involved; the degree to which conifers survive over ten years' efforts to use them in reforestation projects; the susceptibility of coniferous forests and of hardwood forests to damage by fire. Evidence is supplied by local coniferous trees to indicate by the shape of the trees the direction of the local prevailing winds. Study the trees that

are useful in producing tanning materials and how emphasis on their importance has varied through the years. Study trees producing substances of medicinal value.

We might go on with these eminently practical aspects of trees but others may prefer to look at them in other ways. Notice how the poets have varied in their concept of trees. Read *Hiawatha* to notice how its author recognized the uses of conifers such as pine and hemlock. Notice how some poets go into ecstacies about trees in general, or about the "quiet of the woods," while others name their trees and place the right species in the right places and doing the right thing. Poets obviously vary in their understanding of trees.

We might point out many more things about these coniferous plants and how they may figure in the future in our understanding of the nature of the earth. We are told that early arrivals to America were warned of their approach to land in early summer by the color of the sea tinted by the enormous quantities of pollen blown from the great evergreen forests of America's East. Now it looks as though studies made in recent years of pollen found in peat bogs and elsewhere may help us understand much that was obscure about the forests of the past in our land. This is already beginning to reach beyond being of academic importance, and a whole new field of science based on the significance of pollen may arise as a new branch of paleobotany of possible significance in interpreting oil borings. And so the story goes. No matter what facet of natural history we start to explore we sooner or later come to the conclusion that almost any branch offers possibilities we never before appreciated. This is certainly true of our subject this month, the conifers.

State Parks

Evidence of the steady increase in the numbers of State Parks, their facilities and the importance of their place in the recreational picture is contained in the "1955 Yearbook Park and Recreation Progress," published by the National Conference on State Parks, 901 Union Trust Building, Washington 5, D.C., for three dollars. There are reports, with illustrations, from the various States, plus a compilation of data on the parks and their facilities.

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THE Nature CAMERA

By EDNA HOFFMAN EVANS

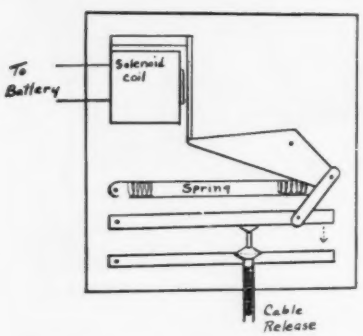
Shutter Releases

THIS YEAR'S JUNE-JULY SECTION of "The Nature Camera" quoted two questions from an Exakta camera user in Illinois, and I am happy to report the receipt of an answer to one of those questions from a reader in Pennsylvania.

The question was: "Is there any kind of an instantaneous solenoid shutter release so that I can catch an animal or bird in an exact pose where the human reaction time would be the slowest factor?" The solenoid supplied as an Exakta auxiliary, the questioner added, was too slow for his purposes.

The answer, from Mr. C. Mervin Mellinger of Willow Street, Pa., is as follows:

"I have read with considerable interest the request in your column for a shutter release for the Exakta camera. The one supplied as an accessory not only worked too slowly, it often refused to trip the shutter at all.



"With the hope of making some pictures of birds by remote control, I have built the illustrated gadget. It employs a solenoid coil taken from a discarded oil burner control. . . . A little experimenting and adjusting was required to make it work, but work it does. It has the advantage of releasing the tension on the shutter release after the shutter is tripped. Some flash guns will drain the batteries if allowed to remain a long time without this pressure being released. I have not tested my Exakta for this.

Rube Goldberg flair

"Perhaps if your correspondent has a little of the mind of Rube Goldberg he can make himself one of these. It seems to work more rapidly than I would be able to operate the cable release, and it does not seem to shake the camera."

It is interesting to note the things we Nature camera fans want to photograph, and to consider the demands we place on ourselves and our photographic equipment. We have to be a combination of inventor, electronics expert, artist, naturalist, gadgeteer, and acrobat in order to get some of the results we want. And every so often our "reach does exceed our grasp," and we want more than our cameras are capable of producing.

The second question posed in the June-July issue, the request for an "electrically operated device which could be mounted on an Exakta to advance the film from a remote control position," remains unanswered. Perhaps there is no such device as yet invented.

As for myself, I had a puzzler as the month of August drew to a close. It defeated me, although perhaps my defeat was more the result of laziness than anything else.

It happened this way. Bonnie, the Shetland sheep dog, was nosing around under the lath shade that covers my Dad's palm nursery in Florida one sultry afternoon. Suddenly she pointed her muzzle into the air, sniffed excitedly, and began barking in the direction of a 50-gallon oil drum standing nearby. The drum was empty and partly covered with the debris that accumulates around a greenhouse.

'Possum in a barrel

I had passed the drum dozens of times during the summer and had paid no attention to it. I assumed that it was full of something or other. But with Bonnie making such a fuss, I proceeded to investigate. I removed things from off the top and found the drum to be almost empty; empty, that is, except for a mother opossum and seven rat-sized baby 'possums. How they had gotten into the drum, or how long they had been there, I do not know. Perhaps Mammy 'Possum had been living there for some time, or perhaps she had just recently moved in to escape the heavy summer rains.

My appearance and Bonnie's barks did not seem particularly to bother the gray-furred, bare-tailed family. The mother glared up and snarled at me. The youngsters reflected something of her resentment, but none of the eight showed any tendency to do anything but stay right where they were.

Opossums are slow, rather stupid creatures. In the past I have tried to tame several, but in each case I was defeated ultimately by the creature's completely passive resistance. Each one ate and slept and snarled—and that was that.

But a family of opossums does offer interesting picture possibilities, so I got the Graflex and the Exakta. I also brought a step ladder so as to get above the top of the drum. So far so good, but from here on I ran into difficulties.

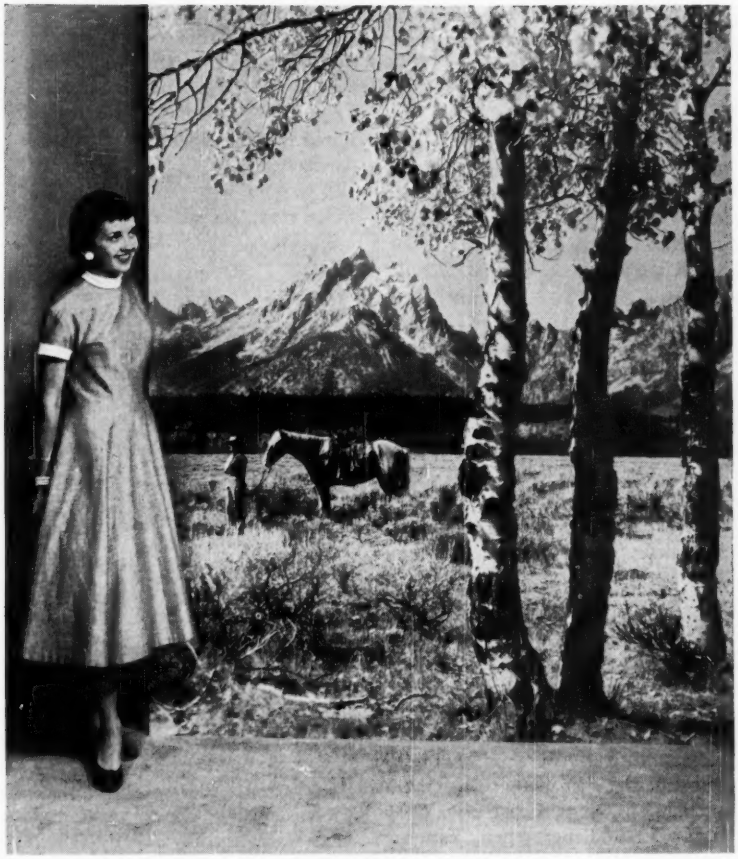
First of all, the slat shade was just 40 inches above the top of the drum. Step ladder or no, I could not get any higher. Besides this, the drum stood just under the edge of the shade and a thick tangle of vines down one side prevented much maneuvering. The opossum family was 27 inches down inside the drum, and the diameter of their metal den was 23 inches.

Problem of light

There was very little light under the shade, and when I took a meter reading into the drum itself the pointer on the indicator did not even move up to "O". The Graflex has no flash attachment. The Exakta flash was many miles away; I had forgotten to bring it with me for the summer. The palm shaded area was not wired, so that ruled out the use of photoflood illumination.

The final result was that I allowed the opossum family to go unphotographed. Of course I could have dumped them out on the ground, but I did not want to disturb them to that extent. So, no pictures. Next morning, of course, they were gone.

I wonder just what method of attack my inventive readers would have taken to solve that photographic problem. I, frankly, was much too lazy to tackle it.



This is a black-and-white copy (with model included for size) of Eastman's 6 x 8-foot color print, which shows the possibilities opening to color photographers. It is believed to be the largest full-color photographic print ever produced, and it was made by direct enlargement from an 8 x 10 inch Ektacolor negative.

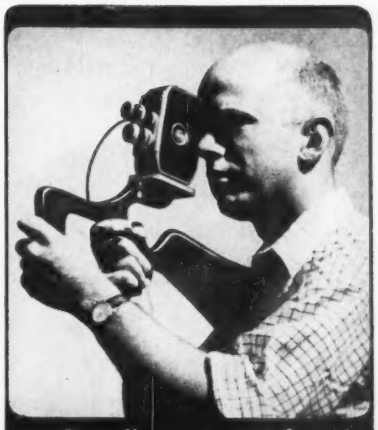
I suppose I have taken as many Nature pictures as the usual enthusiast; probably more than most. Over the years I have developed something of a philosophy; if I miss a picture now and then it does not bother me nearly as much as it used to. The pictures I miss because of mistakes, of course, make me resent my own stupidity. On the other hand, I would rather pass up a picture than upset Nature. The opossum family is a good case in point. Time was when I would have moved the shade, or the oil drum, or have hung by my heels from somewhere in order to get that picture. But this time it seemed much more important to leave things as they were, and to allow the opossums to do as they chose, than it was to get a photograph of them.

Somehow, to me, a Nature picture is a natural picture. I do not want to disturb things, to cut, trim, rearrange, or remove important parts of the setting in order to get a picture. The seeing, the enjoying, the remembering, have become as important as the photographing, and I would rather miss a picture than destroy or disturb things unduly. I wonder whether anyone else feels as I do about leaving things as they are?

More about color

Continuing the discussion of color films, photography, and developments that was started last month, a view of things to come was given recently by Eastman technicians. The "view" took the form of a 6 x 8 foot color print, believed to be the largest ever made by direct enlargement from an 8 x 10 inch Kodak Ektacolor negative on to Kodak color print material, type C.

The enlargement was made with a special projector to a ten-foot-high board. The print was made on two pieces of paper; in the projecting process the negative was kept stationary and each piece of paper was exposed separately. The two pieces



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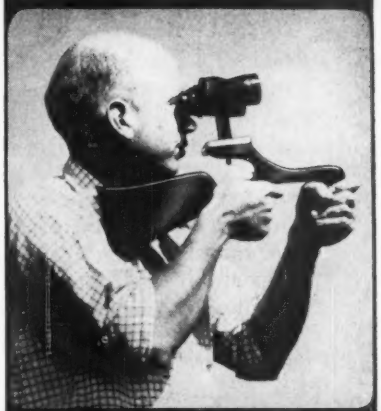

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of paper were processed back-to-back simultaneously to insure uniformity. The finished print was joined down the center and sprayed with a special protective lacquer.

Color prints of photomural dimensions are wonderful things to dream about, but I suspect that their cost will keep them beyond the reach of most color enthusiasts for a long, long time.

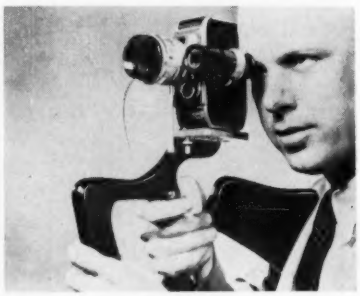
Ansco is likewise active in the color field. That company recently announced a new 3½-gallon-size Anscochrome film professional developing outfit, available at photo shops and other sources of photo supplies at a retail price of $21.45. The outfit contains all of the chemicals needed to process high-speed Anscochrome color transparency film, including two shortstops and two hardeners. Inclusion of the double shortstops and hardeners allows time-saving, straight-line processing. The outfit will process 400 4 x 5 sheets of Anscochrome film.

In the color movie department, high-speed Anscochrome 16mm motion picture film is now being sold without the cost of processing being included in the purchase price of the film. In addition, there has been quite a reduction made in the charge for special high-speed processing of 16mm Anscochrome film. However, since this is a rather restricted field of photographic activity, I suggest that interested movie-makers write to the Ansco Motion Picture Processing Laboratories, 2299 Vaux Hall Road, Union, N. J., or 247-259 Ontario Street, Chicago, Ill., for more specific information.

Telescope as lens

When Bausch and Lomb held its 1956 sales meeting, E. W. Price, assistant consumer product sales manager, proudly demonstrated the use of the BALscope Sr. telescope as a telephoto lens for a Polaroid camera. He reported special interest in this on the part of Nature enthusiasts, who, with this combination, can make long-range study and photography of birds and mammals, and right away examine the results of field pictures before moving on elsewhere.

Gun stock camera mount



Camstock Corporation, Dept. 23, Box 652, Boston 2, Mass., announces a new gun stock mount for all cameras. They call it "Camstock" and point out that it holds all makes of still and movie cameras rock-steady. The user can follow moving objects without "jitter," and can "pan" smoothly even with heavy equipment. With a still camera it makes possible use of slower shutter speeds and lenses that ordinarily would require a tripod. With a special attachment, which is $2.50 extra, this mount will also hold all binoculars. This new device sells for $14.95 postpaid.

Morning Glory

(continued from page 464)

early writers tell us of the strange benumbing or analgesic properties of ololiuqui when applied to the flesh in the form of a salve. One of the chroniclers wrote that, after using such a salve, the Indians felt "a notable ease, which might be, for that the tobacco and ololiuqui have this property of themselves, to benumb the flesh, being applied in manner of an emplaster. . .and for that it did appease and benumb the pain, they held it for an effect of health and a divine virtue." In the Old World, there is a morning glory which has been studied chemically and has yielded an analgesic principle. Who, then, can say that our ololiuqui of the ancient Azrecs may not yet serve mankind in a less satanic way than that which so sorely bedeviled the church fathers of old?

Ma

(Continued from page 489)

sound meager, is really quite adequate. In fact, most snakes are not overfed while in captivity so that they do not grow too fat.

Ma can constrict sometimes, but it depends on how she feels. The same is true as far as shedding is concerned. Recently she shed all by herself, but in the past she has needed assistance. One of the signs of her old age is that she always looks a little cloudy. Most black snakes look thus only when about to shed.

The term "pilot" comes from the legend that this snake guides rattlers and copperheads to safety. Ma has not shown any guiding tendencies, but she has had a particularly amenable disposition most of the seventeen years since she joined the Nature Corner. Perhaps this is due to the frequent handling she receives by the Museum staff members, who use her for Nature lectures in the Junior Museum. The children are permitted to hold and pat her, but only when someone on the staff is present. Ma always takes this attention with good grace. In fact, she seems to welcome the change.

She and Junior, as well as other harmless snakes, are on display in their glass-fronted enclosures all the time. Ma's other friends in the Nature Corner consist of live tropical fishes, marine life, salamanders and frogs, lizards, alligators and turtles.

Elaphe obsoleta obsoleta is also known as the mountain black snake, because rocky, hilly country is much to its liking. It is not uncommon to see one in a tree at a considerable distance from the ground in search of prey. However, Ma does not have a whole tree to climb, but she does have a branch in her enclosure. But Junior seems to do most of the climbing these days.

Desert

(Continued from page 488)

U. S. Forest Service, has said: "This is 777,600 cubic yards, an earth-moving job of major proportions."

In this landscape that oozes away in a rainstorm, natural life is struggling to come back. A total of 3,000,000 pine seedlings have been set out in recent years. It will not be finished easily or inexpensively. It is a formidable job.

An excellent place to observe the Copper Basin Desert is from the vantage point of a hill that overlooks the new General Hospital. The hospital has a luxurious, green carpet of a lawn in the midst of desolate, red, denuded land! As one looks over the landscape, he sees here and there long bandages of green running through the open sores of the gullies. This is the resolute, miracle healer-plant, kudzu. Green becomes a color most dear at the Copper Basin Desert. A few minutes spent at the hill overlooking the hospital causes the visitor to sense that the healing process is many sided.

The Copper Basin Desert, its history, and its effort to become green again, is an extreme example of erosion, but an example of what can happen.

A few years ago, it was found that the wind velocity was thirteen times greater in the Copper Basin Desert than in nearby forests. The average soil surface temperature was 22 degrees higher. Even today the wind moans across the Desert with the same loneliness as it does through the canyons of our great cities.

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Mangrove

(*Continued from page 459*)

Living as they do on the inhospitable tidal borderlands where they are almost completely free from competition with man, mangroves may be spared the intensive depredation usually associated with his interest in an economically important plant.

On the sheltered margins of tropical seas, mangroves will undoubtedly continue to occupy their unique niche in Nature's scheme of things, feeling the eternal pulse of the tidal currents, bearing their young alive and launching them in the water at their feet, and all the time "walking" continuously, if imperceptively, on their curious, stilt-like roots out to sea.

Mice

(*Continued from page 472*)

So far as is known the habits of the dusky tree mouse are similar to those of the red. Walker's mice, however, were taken from hemlock trees and preferred a diet of hemlock needles and twigs.

In their wind-combed evergreen play-grounds, it is believed that many tree mice are born, grow to adulthood, build their nests, reproduce and die—all without ever touching the earth. To us human beings, tied here below during the whole turn of the wheel, it sounds an idyllic existence.

Immigrant

(*continued from page 462*)

manner, that is, pulled back in.

So much for characteristics. It is quite obvious that *Bulbulcus* merits a great deal more field study and research. Meanwhile, it is welcome news that a desirable bird, unlike the less-fortunate whooping crane or the Everglade kite, is rapidly increasing in numbers despite the perils of civilization. It is also good to know that this immigrant, unlike the English sparrow and the starling, has not yet exhibited any bad habits.

Florida and other southern ranchers are watching the new arrival with interest. If it does not become so numerous that it will bother or annoy grazing herds, the cattle egret may be the answer to a number of prayers. In the first place, the egret's diet consists largely of destructive insects. By eating grasshoppers, beetles, crickets and other insects injurious to grass, pastureland will be improved. Whether there is any connection between the arrival and increase of the cattle egret, and the reduction of ticks on Florida ranches in recent years, would be difficult to prove without more study of the bird's eating habits and habitat. It has been observed taking flies off cattle.

This much is for sure: if the cattle egret is really a tick fancier, it will be enshrined as something of a "sacred bird" by cattlemen. And woe to those found harming it in any way!

Timberdoodle

(*Continued from page 485*)

is too sparse. Some spots have been fertilized and limed in an attempt to restore the fertility and the worms. A lot of these experiments show real promise, and the best of the procedures will undoubtedly become a part of the overall management program for this bird in the near future.

Another interesting thing was uncovered during the studies. It appears that woodcock return to the place where they were born to mate and nest. This does not necessarily mean on the same acre, but at least in the close vicinity. So when the "native" birds are shot down too closely, the supply may be poor for several years in that particular covert simply because no birds stop to nest there. Thus, it is important that the bag be regulated by Federal or State wildlife agencies, or by the woodcock hunters themselves.

During the hunting season in October and November, the biologists are especially busy. On selected areas almost every woodcock hunter is contacted for information. The "regulars" are visited before season and handed some data blanks to fill out each time they go chasing Mr. Big-eyes. When a strange car is spotted on the study area, a form with a pencil and a thumbtack is left under his windshield wiper. When the hunter returns, he fills in the information about how many woodcock he saw, how many he killed, how long he hunted, and so on, and tacks the paper to a nearby tree or fence post.

When the technicians can check the hunters in person, he examines their birds for bands, weighs them, and measures the length of their bills and the width of the outer wing feathers. The female woodcock are larger throughout than the males and have a bill that will average about a half-inch longer. Also, the three very narrow outer flight feathers, which produce the characteristic whistle of a woodcock in flight, are slightly wider in the hen. The biologist may even ask for the stomachs so that he can later determine in the laboratory what the birds have been eating and how much of each.

The hunters cooperate in this work, anticipating a beautiful October day, with crisp fall air and highly colored foliage, and plenty of woodcock in the coverts.

Boreus

(*Continued from page 490*)

fauna, our acquaintance with Boreus is for the most part recent. Even when recorded from the various States, the listed localities where known populations occur are few and far between. Yet surely this paucity of specimens and locality records does not reflect the actual situation in Nature. Rather, Boreus may be numerous in many appropriate places. His seeming rareness is due to the lack of observers who know of him and where to look for him.

Those of us who find pleasure being outdoors even on winter days can look forward to a meeting with the curious Boreus. A quest in search for him adds much zest to an afternoon walk in the woods. If successful in finding him we may be able to add more distributional data to our scientific knowledge of an unusual insect.

Planets

(*Continued from page 492*)

Mars is fast receding from the Earth. Already up in the southeast at sunset, it will be seen in the south at about 8 P.M. on November 15 and will set at about 1:30 A.M.

Jupiter, in Virgo, will appear as a morning star of magnitude −1.4. It will rise at about 2 A.M. on November 15.

There will be a total eclipse of the moon visible everywhere in this country during the night of November 17 to 18. This is the first total eclipse of the moon visible here since that of January 18, 1954. The eclipse will start at 3 minutes after midnight E.S.T., and will end at 3:33 A.M.

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Nature AND THE MICROSCOPE

By JULIAN D. CORRINGTON

Ward's Natural Science Establishment as it appeared in 1884. The whale jaw-bones over the gate were for years a familiar landmark in Rochester.

Science Shops 9

Ward's Natural Science Establishment, 3.

In two previous articles we have related a few of the countless exploits of Henry A. Ward, as a collector and as a museum builder. So intimately is the career of this astounding man tied in with that of the institution he founded that their stories are inseparable.

Ward's Natural Science Establishment, like Topsy, was not born at all but just grew. If we try to assign a definite date for its inception, we might choose 1863, when the celebrated Ward Geological Cabinet, finest in America, was turned over to the University of Rochester for twenty thousand dollars, a sum that had to be raised through public subscription. But actually Henry had been peddling fossils all over Europe as early as 1856. In Dr. Fairchild's introduction to the volume from which we have been gleaning a majority of our facts thus far (*Henry A. Ward, Museum Builder to America*, by Roswell Ward, Rochester, 1948) he states: "The name Ward soon became as well known in America as it was in Europe. His passion for exploration and for acquisition of rare specimens in geology and zoology found purpose and outlet in the Ward's Natural Science Establishment, that from about 1865 to the present has been the great emporium for distribution of natural science material."

Cosmos Hall was built in 1862 and, since this was the first Establishment in the physical sense, that date appeals to this writer as the logical selection. The present administration of the company uses 1862 as its date of founding. On his concluding page, Roswell Ward says, "Ward's Natural Science Establishment has gone through four somewhat tempestuous phases in its 85 years of existence." As the copyright and publication dates of the volume are 1948, this gives 1863 as the date of founding.

In 1869, following destruction of Cosmos and Chronos Halls by fire, Ward decided to give up teaching and devote his entire energies to supplying the needs of colleges and museums in his chosen fields of interest, and it was then that he first employed the phrase "Ward's Natural Science Establishment." Local people in Rochester usually dubbed the College Avenue buildings "Ward's Museum," and some do to this day. Officially the business went under a number of titles, as "Ward's Casts of Fossils and Geological and Mineralogical Cabinets," or "Henry A. Ward—Ward's Museum of Mineralogy and Zoology," but finally, in 1878, "Ward's Natural Science Establishment" became the official and published designation of the rapidly expanding firm.

Beginning with geological specimens, Ward had added, while still a one-man concern, first fossils and then a variety of zoological exhibits, principally mounted skins and skeletons. He was the only person permitted, in most cases, to make plaster molds and casts of the unique and priceless fossils and archaeological bric-a-brac in European museums, and found this a lucrative business. For example, Ward sold hundreds of copies all over America of his reproduction of the Rosetta Stone, the famous key that unlocked the secret of Egyptian hieroglyphics. As he began to acquire assistants, other specialties were added. His brother-in-law, Edwin Howell, developed the art of making relief maps, a branch of the organization for which Ward's became noted among geographers. Howell was made a partner for the geological division alone and for a number of years that portion of the company was designated as "Ward & Howell," but in 1890 Howell withdrew to establish his own business in Washington, D. C., "Howell's Microcosm."

Roswell Ward, grandson and biographer of the Professor, considers the years 1878 to 1883 as the Golden Age of Ward's, the terminal date marking the departure of William T. Hornaday to accept the position of Chief Taxidermist with the United States National Museum at Washington. The loss of Hornaday was keenly felt and, although replaced by the arrival of Carl Akeley, it was significant as indicating a change in museum policy—that of employing their own staff instead of relying on Ward's, the mother institution. The present writer would extend the Golden Age to 1897, when Henry married the wealthy widow, Lydia Avery Coonley, and went to live in her palatial residence on Lake Shore Drive in Chicago. No longer was he under the financial compulsions of earlier years.

Phebe Howell Ward had passed away in 1891, when Henry was 57 years of age, and he met Mrs. Coonley at the time of the Columbian Exposition in Chicago two years later. In another year he was paying court to her in a manner to belie his sixty years, and it was said—even by the lady herself—that he was after her money. This he denied with great vigor; but he lost his suit just the same—only to be accepted some time later, as his persistence never flagged.

By this stage of his career, Professor Ward was more and more engrossed in his collection of meteorites, and in this phase of his travels Mrs. Coonley-Ward (she preferred the hyphenated name) acceded and provided funds, the growing cabinet coming to be known as the Ward-Coonley Collection. This was a private venture, not connected with the Establishment, and his interests in his old firm declined directly as his obsession with meteorite collecting increased.

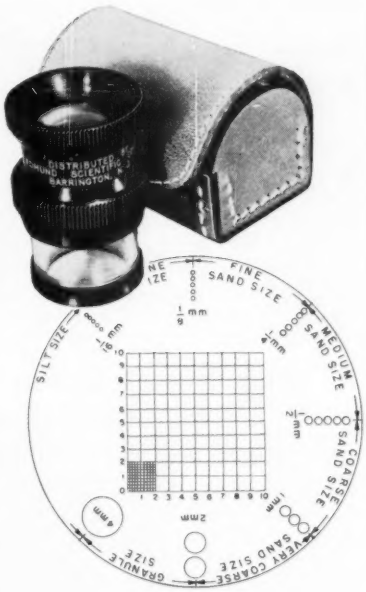
By this stage also, management of the Establishment's affairs passed more and more into the hands of others. As we have noted, the Professor was certainly no financial wizard, frequently selling large cabinets at less than cost in order to realize some ready cash, which was then immediately sunk in the purchase of more specimens. His grand-

father, Dr. Levi Ward, grand old patriarch of the Ward family, and more especially his uncle, Levi A. Ward, frequently had to step into the breach and advance sums of money, sometimes large sums, in order to pay up Henry's debts. There was no such thing as cost accounting, and Henry would never price his materials as should have been done in the running of a sales organization, since his interests were entirely scientific and not at all commercial. His whole objective from the start had been to provide teachers and museum officers with every possible specimen and exhibit in order to display the whole of Nature's grand plan. His business acumen was not only childlike—it was non-existent.

In 1881 Levi A. Ward died, and his two sons, as executors of the estate, attempted to obtain a statement of the finances of the Establishment, into which their father had sunk so much money. It took them two years to do so. They were Lee Ward (Levi F. Ward) and Frank Addison Ward, first cousins of the Professor. Business was prospering, and so a showdown was delayed, but inevitable. By 1888, Frank A. Ward, who had become his partner in all departments save geology, and Howell, partner in geology, began to put the screws on the Professor's unlimited spending for expeditions and purchases. They looked at the Establishment as a supply house; the Professor regarded it as an adjunct to education. The first must have a profit motive; the second must not. And so the great world traveler turned more and more to his latest, largest, and last hobby, his meteorites.

Over the globe he went, visiting every continent repeatedly, inducing even the most inaccessible rulers and authorities to part with portions of their revered heaven-stones. Wherever a fall was reported, there went Henry Ward. In time his collection became the world's largest and finest; no risk or hardship seemed too great for this indomitable man, although at the turn of the century he was in his late sixties. The 1904 catalog of the Ward-Coonley Collection listed 603 falls. On the Fourth of July, 1906, aged 72, Henry A. Ward walked in front of an automobile in Buffalo, and was thrown to the pavement, dying of a fractured skull and brain injuries a few hours later. Ironical, indeed, that the man above all others then living who had taken the most appalling risks in every corner of the earth, and who had escaped wild animals and savage men, tropical fevers, poisons, and all the mighty forces of Nature should have met this ignominious end in an American city, near his birthplace!

In our next installment we shall carry the fortunes of Ward's into the era of the leadership of Frank A. Ward.



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Optical Tricks

3. Candle Burning in Water

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An interesting home demonstration that uses this same principle is easily arranged. A French door is ideal to represent our store front, but if not available, any good clear sheet of glass, well cleaned and polished, will serve. A slot in a block of wood will enable you to stand the glass vertically upon a table. We shall describe the setup for the French door, but the reader can readily modify the procedure to apply it to the separate glass sheet.

Use two chairs or tables of the same height and place these on opposite sides of the door. On one stand a milk bottle full of water, on the other a burning candle. The disposition of these articles must be exact, according to the following directions: the candle is on the observer's side of the door; both bottle and candle must be at the same height and same distance from the glass and both must be on the same normal (perpendicular) to the glass. In other words, a line connecting bottle and candle would pass through the glass vertically, making a 90° angle with the glass.

Viewed obliquely, either in daylight or at night, the candle appears to be burning inside the bottle of water. If the direct view of the candle is screened from the observer the mystery is heightened, and presents in miniature the basic principle of many stage illusions. If the operator will make a diagram of the layout, reproducing the conditions stressed above, and remembering the law of the mirror, that the angle of incidence equals the angle of reflection, he will see how this optical trick is explained.

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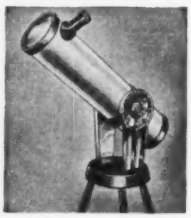

A precision-made 32 power reflecting telescope—by the makers of Spitz Planetarium. Clearly reveals the craters of the moon, shows Saturn, Jupiter, other wonders of the heavens. Based on same principles as world's giant telescopes. Stands 36" high on removable legs. Adjustable 3" polished and corrected mirror. Fork type Alt-Azimuth rotates on full 360 circle—swings to any location in the sky. Fascinating 18-page instruction book is included. Instrument packed in sturdy carrying case.
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Take Me Out of the Zo Class

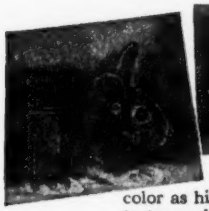
(Take Me Out to the Ball Game)
Albert von Tilzer

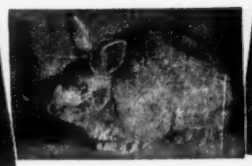
Take me out of the Zo class,
Take me out of the lab.
I love my English and History
But I can't go all this taxonomy.
Let me parse, parse, parse all the
French verbs
Or give the Speech Prof. the gab,
But it's f, F, F, and you're out
Of the old Zo lab.

Oops, — Sorry!

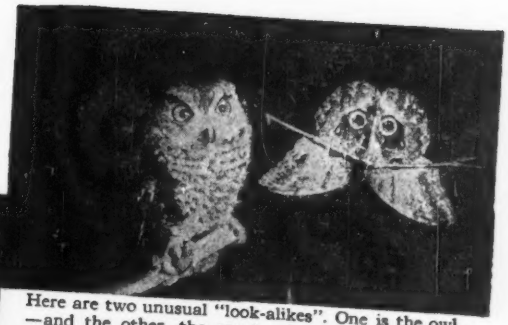
As kindly called to our attention by Dr. R. A. Diettert, Montana State University, we used the wrong illustration in our article on *Equisetum* in the August-September issue. How *Lycopodium* got into the act we still do not know—but there it was!

NOW READY! ***A new educational program for the whole family..sponsored by*** **THE NATIONAL AUDUBON SOCIETY**





In summer, the snowshoe rabbit is the same color as his tundra home. But when snow comes he begins to turn white—and soon he's camouflaged again!



Here are two unusual "look-alikes". One is the owl —and the other, the spectacular Calico Butterfly which often alights *upside down* with his "owl-eyes" showing! Nature "protects her own" with fascinating camouflage!

What will these unusual creatures grow up to be? You'd never guess!

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There is no subject more satisfying and worthwhile for young and old than the study of Nature. And the best way to undertake this fascinating quest would be in the personal company of friendly and inspired naturalists, such as those on the Staff of the National Audubon Society.

These scientists would show you how cleverly Nature "protects her own" with camouflage. . .explain the strange ways in which some animals reproduce, and rear their young. *Best of all, they would open your eyes to the wonders in your own back yard or park!*

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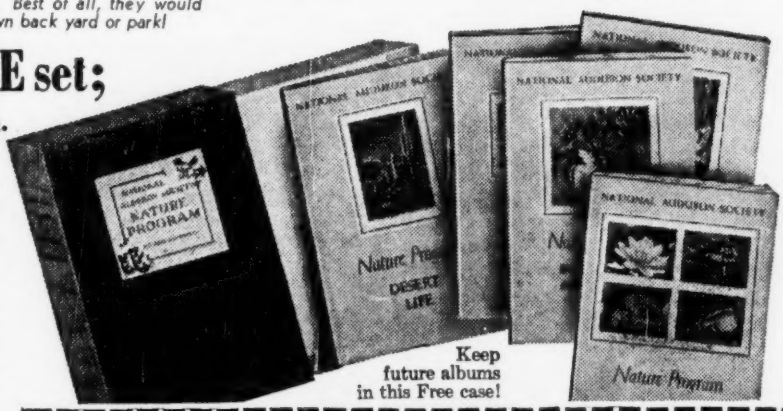
The "Museum-at-Home" Nature Program was developed to bring to *your home* the closest possible equivalent to this kind of *thrilling personal guidance*. Each month a fascinating new topic is selected, and you and your family explore it together with the National Audubon Society's experts. For each topic, a collection of about thirty natural color prints—usually brilliant true color photographs—is issued, together with an album in which the prints (already gummed for this purpose) may be mounted. An interesting fact-filled text explains your "Museum-at-Home" exhibits. And the total cost is very low; only $1 for each set, plus a few pennies for shipping.

Your albums and color prints will rapidly grow into an "armchair museum" of Natural History—a "museum" visited again and again by the whole family! Begin your enrollment now with a Free Gift. Send the postage-free card—without money—today.

Begin with a FREE set;

withdraw whenever you wish.

You assume no obligation when you send the enrolment Post Card at right, and receive your first album, CAMOUFLAGE IN NATURE, as a FREE Gift. You may resign your enrollment *at any time you wish.* But we feel sure that once your family has become acquainted with the "Museum-at-Home" Nature Program, you will want to continue these delightful monthly "visits" for a while. That's entirely up to you, of course. However, we urge you to send the post card NOW to be sure to get your first set FREE—and without obligation. If you act at once, you'll also receive a handsome maroon and gold color *protective case* for your albums, without charge. Quantities are limited. Please cut out the post card at right—fill in your name and address—and mail today.



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